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**Rocky Intertidal Monitoring
Channel Islands National Park
1997 Annual Report**

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Abstract

The 1997 effort and results are presented for the Channel Islands National Park Rocky Intertidal Monitoring Program at fifteen permanent sites established on park islands. Normal protocol calls for visiting each site in the spring and fall. Most sites were visited once in 1997 because of logistical problems stemming from bad weather. Only sites on San Miguel Island were visited in both the spring and fall. Permanent photoplots were monitored for changes in percent cover of selected indicator organisms. Species presence/absence and motile invertebrate counts were made in 1997 in most photoplots. Abundance (density) and size frequencies of black abalone, *Haliotis cracherodii*, and owl limpets, *Lottia gigantea*, were taken in both permanent plots and in timed searches. Seastar (generally *Pisaster ochraceus*) abundance was measured in timed searches or fixed transects. Temperature loggers are now in place at eight of the sites covering all four islands.

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Executive Summary

Fifteen monitoring sites (figure 1) were visited at least once in 1997. Sites on San Miguel, Santa Rosa and Anacapa Islands were monitored in the spring. Santa Barbara, Santa Rosa and San Miguel sites were monitored in the fall. Heavy rains or large surf during low tide periods delayed or prevented access at some sites and limited monitoring activities at other sites.

1997 was the beginning of one of the strongest El Niños ever recorded (McPhaden 1999). Some damage in the form of bare patches was observed in mussel beds and some algal cover was lower than normal; however, damage was less than expected based on observations from 1984. Ironically, *Anelopus japonica*, a northern brown alga, was found at Crook Point, San Miguel Island in April.

Barnacle cover was high at Cuyler Harbor and Crook Point in the spring surveys, but fall samples showed Landing Cove, East Point, and Harris Point barnacle cover to all be at the lowest levels for those sites. Endocladia, which nearly disappeared from Anacapa following the 1983 El Niño, was near the mean cover at most sites, but at low levels at Sea Lion Rookery, Fossil Reef, Johnson's Lee and Otter Harbor in 1997. Rockweed cover was normal in the spring, but Landing Cove and Sea Lion Rookery both had only 20% cover, well below the mean at those sites of 70% and 50% respectively. East Point and Cuyler Harbor, however were each above normal with over 80% rockweed cover. Red-algal turf cover was the lowest ever at Landing Cove, primarily because of surfgrass expanding its cover within some plots. Mussel cover was above average at Cat Rock, Crook Point, Harris Point, and Otter Harbor, but well below the mean at Sea Lion Rookery, Fossil Reef, and Johnson's Lee. Seasonal differences were observed at the San Miguel Island sites with decreases in acorn barnacles and *Endocladia muricata* and increases in *Pelvetia fastigiata* in the fall. Damage from waves is at least partly responsible in most declines.

Black abalone, *Haliotis cracherodii*, continued to decline at all sites. No abalone were found at Santa Barbara Island, and only three were found at Anacapa. On Santa Rosa Island, black abalone were rare to uncommon. Black abalone were only found in one of five plots at each of Crook Point and Otter Harbor sites on San Miguel Island. Numbers of

black abalone continued to decline at Harris Point, even declining from 69 to 56 within the plots over nine months. Withering Syndrome was observed at both Santa Rosa and San Miguel Islands and is still the most likely the cause of the continued decline in those populations.

Black abalone were surveyed at North Green Mountain Canyon, Haithuan Reef, Leuzarder Point, and Willow Canyon in addition to the regular sites on San Miguel Island. Counts of motile invertebrates were made at most sites for snails, limpets, and chitons within the fixed photoplots. This was the first time the counts have been done and will serve as baseline information. Temperature loggers were deployed at Johnson's Lee, East Point, and Northwest Talcott on Santa Rosa Island. Loggers were deployed on San Miguel, Anacapa, and Santa Barbara Islands in 1996.

Owl limpet, *Lottia gigantea*, densities declined at both Santa Rosa and San Miguel Islands in 1977 (Figures 10 and 11). On Santa Rosa Island, declines occurred mostly at Johnson's Lee. Northwest Talcott showed a peak increase in spring 1997 but elsewhere numbers remained basically unchanged.

Sea star numbers at Landing Cove, Santa Barbara declined by half from 1996.

Over 3,200 visitors landed at South Frenchy's Cove on Anacapa Island in 1997, with 74% of the visitation occurring between February and May. March was the busiest month with 958 visitors in the tidepools.

A Multi-Agency Rocky Intertidal Network (MARINE) was formed with leadership from the Minerals Management Service to provide support, maximize coordination, and improve communication between the different agencies conducting rocky intertidal monitoring in southern California. We expect the network to increase access to the data for all users, integrate monitoring and analytical efforts, and address questions beyond the scope of individual programs. In September, a small oil spill occurred off Point Arguello. The MARINE Science Panel responded for initial assessments and it proved to be a valuable learning tool.

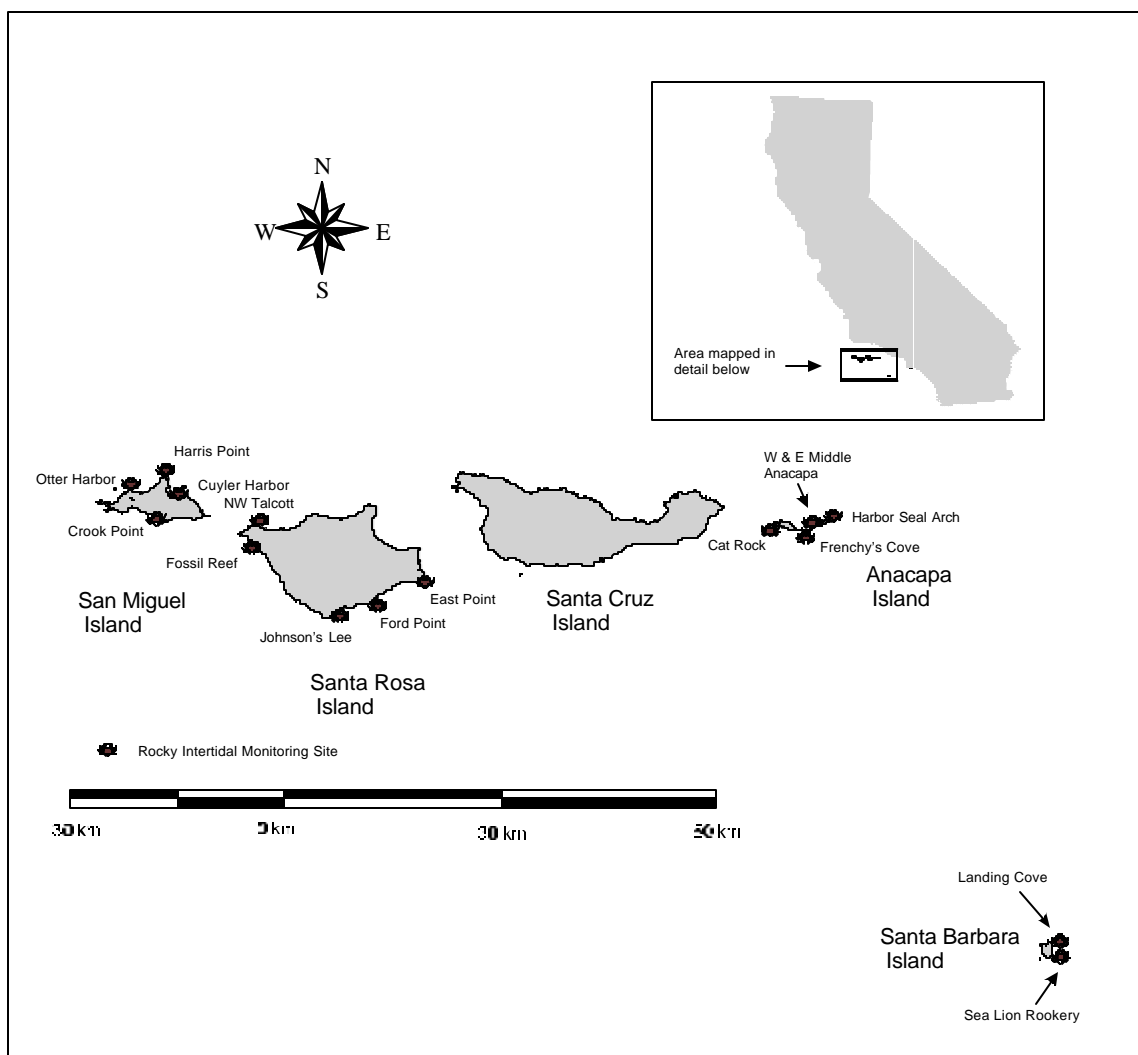


Figure 1. Rocky Intertidal Community Monitoring Site Locations in Channel Islands National Park

Introduction

The rocky intertidal zone is a rich and wondrous place at the meeting of marine and terrestrial habitats. Exposed to the air part of each day, the marine organisms living there must survive the drying sun and winds and occasional freshwater rains during low tide. Terrestrial animals taking advantage of the low tide to forage for food (or study the marine life) must flee the incoming tides or risk the consequences. Temperature extremes and wave force reach their maximums here at the shoreline, yet the diversity of life is high. In

fact, many organisms are so well adapted to this dual lifestyle that they cannot live without the alternating exposure to both the air and sea.

Channel Islands National Park and National Marine Sanctuary encompass the four northern Channel Islands and Santa Barbara Island off the coast of Southern California. The park islands and surrounding waters also bear designations as International Biosphere Reserve and State of California Areas of Biological Significance. The State of California exercises jurisdiction over the living marine resources and manages them through the California Department of Fish and Game.

The undisturbed tide pools are one of the features specifically mentioned in the enabling legislation for Channel Islands National Park. Rocky intertidal monitoring has been ongoing since 1982 with the following goals: 1) to monitor trends in population dynamics of selected indicator organisms, 2) to determine normal limits of variation, 3) to discover abnormal conditions, 4) to provide remedies for management problems, and 5) to measure the effects of management actions.

This report summarizes the 1997 calendar year efforts and findings of the Rocky Intertidal Monitoring Program. Monitoring results were previously reported in Richards (1986) for 1982-1985 and Richards (1988) for 1986-1987. Black abalone monitoring results have been presented in Haaker et al. (1992), Davis et al. (1992), and Richards and Davis (1993). A compilation and summary of all years is in preparation.

Methods

Fifteen sites on four park islands are monitored each spring (Feb.-May) and fall (Oct.-Jan.) (Figure 1). Nesting brown pelicans and abundant California sea lions have led to dropping spring monitoring at Santa Barbara Island since access to at least one of the two sites would cause major disturbance at crucial times for these species. Black abalone, *Haliotis cracherodii*, were surveyed at additional San Miguel Island sites.

The monitoring protocol is detailed in Richards and Davis (1988). Fixed 50 x 75 cm photoplots are used to measure cover of common species in four intertidal zones.

Photos were taken of each plot. Most photoplots were scored in the field using a string grid with 100 points. When time or conditions did not allow field scoring, percent cover was scored from slides projected onto a grid of 100 points.

Black abalone were counted and measured in fixed plots initially established around congregations of more than 30 abalone. The power to detect changes in the population declined with the extreme declines in the abalone density (Richards and Davis 1993); however, and the method was changed to a 30-minute search covering each site to measure and count abalone. Abalone measurements were made at four additional sites on San Miguel Island to assess the overall condition of abalone on the island. These sites were Leuzarder Point on the southwest end, the mouth of Willow Canyon on the northeast side, and two rocky reefs between Simonton Cove and Otter Harbor on the northwest side of the island.

Thirty-minute searches were also used to count sea stars (generally *Pisaster ochraceus*) at most sites. Sea stars were counted in fixed transects at Harris Point and Landing Cove.

Owl limpets, *Lottia gigantea*, were measured within abalone plots at San Miguel Island. At Santa Rosa Island, owl limpets were measured in fixed circular plots set up around owl limpet aggregations. Owl limpets at Anacapa and Santa Barbara Islands were counted and measured in a haphazard fashion during timed searches.

Shorebirds and marine mammals were counted upon arrival at each site. A general species list of macro invertebrates and algae was made with varying degrees of effort depending on time available at each site. A detailed census of invertebrates and algae was made of each photoplot. The census provides a presence/absence list of species not detailed in the analysis of percent cover.

The numbers of snails, limpets, and chitons were recorded within each photoplot this year. A site to site comparison of plots may shed light on effects of rat predation on Anacapa for example. Most counts were done in either the entire fixed plot or within a 50 x 50 cm area within that plot. Because of the difficulty of counting highly abundant and

tiny snails, *Littorina* spp. were counted in smaller subsamples. Specific plot sizes are given in the trip reports in the appendix.

Optic StowAway™ temperature loggers were installed at East Point, Johnson's Lee, and Northwest Talcott sites on Santa Rosa Island in 1997. Loggers installed in 1996 at Crook Point and Harris Point on San Miguel, Landing Cove on Santa Barbara and Middle-West and South Frenchy's Cove on Anacapa Island were downloaded. The loggers record temperature approximately every hour. A PVC housing with screw on end caps was attached to the rock at approximately the +1 ft tide level. The sealed, waterproof loggers were protected inside the housings from bio-fouling and rock damage. The housing does permit some water entry but not flow-through water. The loggers were downloaded in the field using an Optic Shuttle™ to temporarily store the data, then transferred to a computer file. This is a cooperative project with Dr. Steve Gaines at the Marine Science Institute at University of California, Santa Barbara. The Gaines lab supplied the temperature loggers.

Taxonomy for this report follows Abbott and Hollenberg 1976, Smith and Carlton 1975, McLean 1978, and Morris, Abbott, and Haderlie 1980.

Results

Specific observations and findings of 1997 are presented in the trip reports for the year, which follow in appendix D. Trip reports are arranged by island. The fall sampling at Santa Rosa Island was delayed because of weather until January 1998, and that sample is presented here as fall 1997. Table 1 below shows the sampling dates for each site. Note that the full sampling protocol was not done on all dates.

Photoplot summary data are presented in Figures 2 and 3 for each indicator taxa by zone. Sample mean percent cover values for each site are compared to the range and mean of yearly cover values for all years at that site. Complete photoplot data for 1997 are presented in Appendix A. Photoplot species census tables are presented in Appendix B. General species lists for all sites are presented in Appendix C.

Barnacle cover was high at Cuyler Harbor and Crook Point in the spring surveys, but fall samples showed Landing Cove, East Point, and Harris Point barnacle cover to all be at the lowest levels for those sites. *Endocladia*, which nearly disappeared from Anacapa following the 1983 El Niño, was near the mean cover at most sites, but at low levels at Sea Lion Rookery, Fossil Reef, Johnson's Lee and Otter Harbor in 1997. Rockweed cover was normal in the spring, but Landing Cove and Sea Lion Rookery both had only 20% cover, well below the mean at those sites of 70% and 50% respectively. East Point and Cuyler Harbor, however were each above normal with over 80% rockweed cover. Red-algal turf cover was the lowest ever at Landing Cove, primarily because of surfgrass expanding its cover within some plots. Mussel cover was above average at Cat Rock, Crook Point, Harris Point, and Otter Harbor, but well below the mean at Sea Lion Rookery, Fossil Reef, and Johnson's Lee. Seasonal differences were observed at the San Miguel Island sites with decreases in acorn barnacles and *Endocladia muricata* and increases in *Pelvetia fastigiata* in the fall. Damage from waves is at least partly responsible in most declines.

Table 1. Sampling dates for Rocky Intertidal Sites (not all sampling performed on each visit)

Site	Spring	Fall
Cuyler Harbor, SMI	4/2/97	11/12/97
Crook Point, SMI	4/3/97	11/14/97
Otter Harbor, SMI	4/4-5/97	11/13/97
Harris Point, SMI	2/3, 4/6/97	11/15/97
Willow Canyon, SMI	4/7/97	
Leuzarder Point, SMI		11/16/97
Fossil Reef, SRI	2/19/97	1/26/98
Johnson's Lee, SRI	5/12/97	1/23/98
Ford Point, SRI		1/25/98
Northwest-Talcott, SRI	2/20, 5/11/97	1/24/98
Cat Rock, AI	3/5/97	
South Frenchy's Cove, AI	3/4/97	
Middle-West, AI	3/6/97	
Landing Cove, SBI		10/14, 10/16/97

Sea Lion Rookery, SBI		10/15/97
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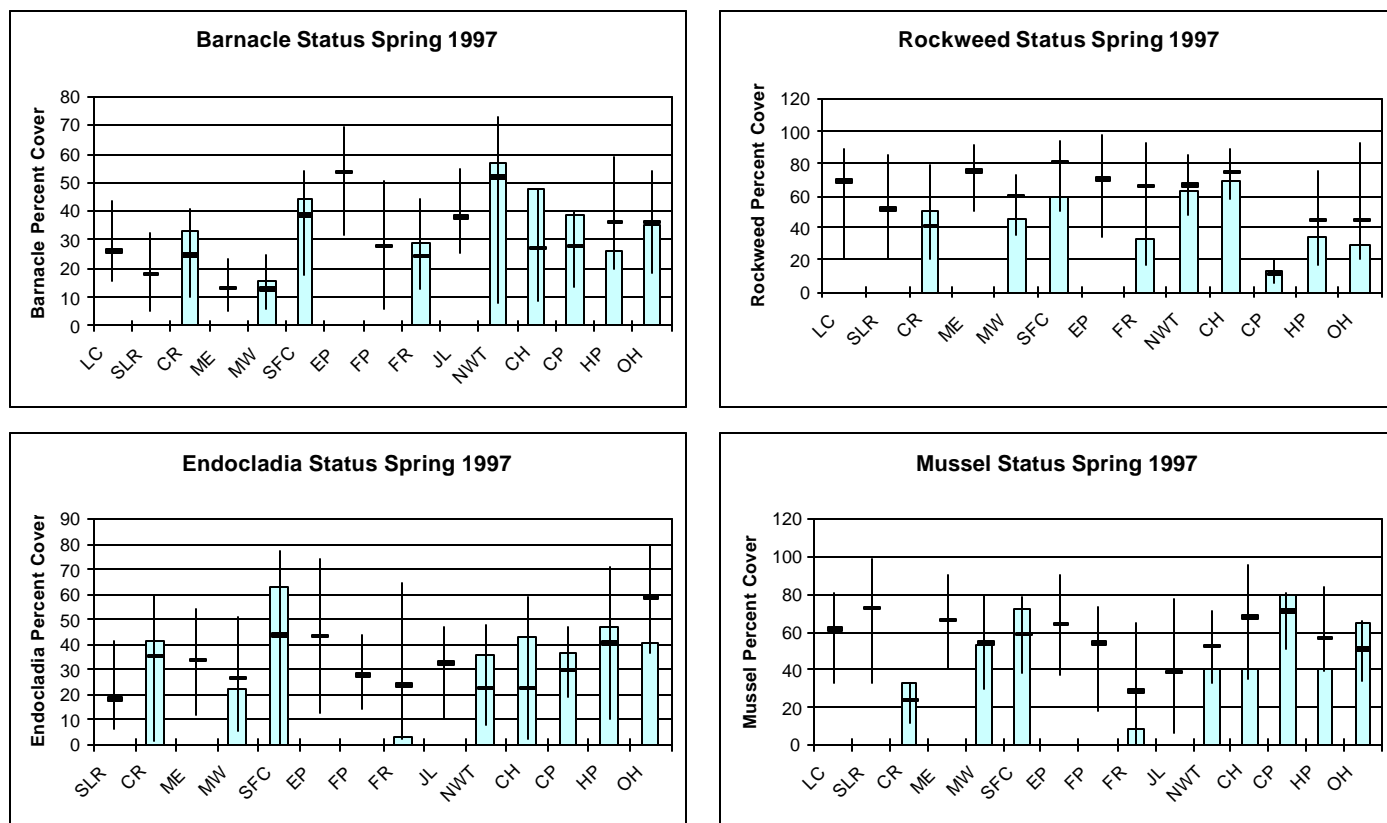


Figure 2. Percent cover of taxa within fixed plots by zone, spring 1997.

Bars represent the spring 1997 mean percent cover from five¹ plots within that zone. Vertical lines represent the range of means since monitoring began at that site. Horizontal lines mark the overall mean for all years at that site. There is no data available for this season at sites without bars. Sites: Santa Barbara Island- Landing Cove, Sea Lion Rookery; Anacapa Island- Cat Rock, Middle-East, Middle-West, South French's Cove; Santa Rosa Island- East Point, Ford Point, Fossil Reef, Johnson's Lee, Northwest Talcott; San Miguel Island- Cuyler Harbor, Crook Point, Harris Point, Otter Harbor. (¹Cat Rock data are from nine plots, Middle East from three plots).

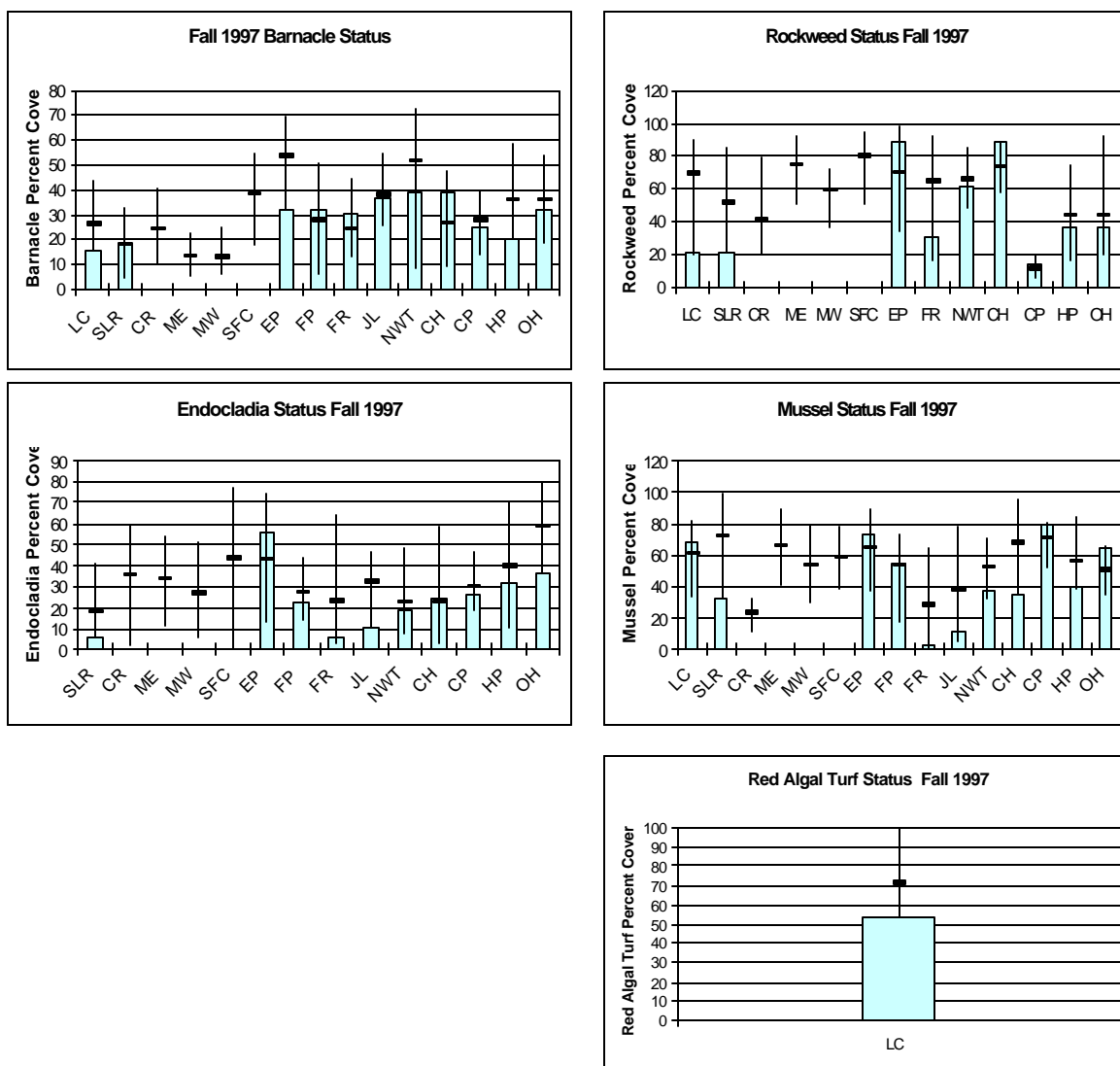


Figure 3. Percent cover of taxa within fixed plots by zone, fall 1997.

Bars represent the fall 1997 mean percent cover from five¹ plots within that zone. Vertical lines represent the range of means since monitoring began at that site. Horizontal lines mark the overall mean for all years at that site. There is no data available for this season at sites without bars. Red algal turf is monitored only at Landing Cove. Sites: Santa Barbara Island- Landing Cove, Sea Lion Rookery; Anacapa Island- Cat Rock, Middle-East, Middle-West, South Frenchy's Cove; Santa Rosa Island- East Point, Ford Point, Fossil Reef, Johnson's Lee, Northwest Talcott; San Miguel Island- Cuyler Harbor, Crook Point, Harris Point, Otter Harbor. (¹ Cat Rock data are from nine plots, Middle East from three plots).

Black abalone numbers were low at all sites. Only Fossil Reef had any abalone within the monitoring plots on Santa Rosa Island. On San Miguel, numbers continued to decline at Harris Point, and only one plot at Otter Harbor and one plot at Crook Point had abalone within them. One of three abalone found at Cat Rock, Anacapa was within a fixed abalone plots. Only at Harris Point and Leuzarder Point on San Miguel Island, could black abalone be considered common. Even with general searches over an entire site, it was difficult to find enough abalone (30) for size frequency analysis (Fig. 4). Juvenile abalone (<45 mm) were rare at all sites. Leuzarder Point on San Miguel was the most promising site with nearly 300 abalone found in just over an hour. Shrunken abalone, indicative of Withering Syndrome (Haaker et al. 1992), were observed at Santa Rosa and San Miguel sites including Leuzarder Point. Black abalone size distributions for individual sites are presented in the trip reports (Appx. D). Figures 6, 7, & 8 show the steady decline of black abalone densities at the different islands. Figure 9 shows the average density of black abalone at all sites in 1985 compared to 1997. Most 1997 densities are negligible and barely visible on the scale next to 1985.

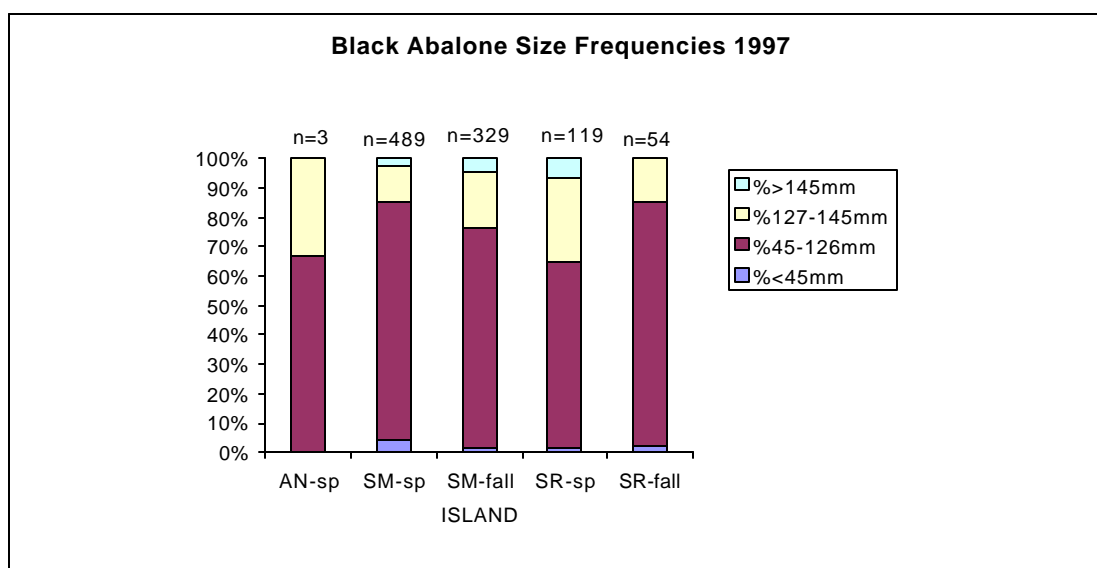


Figure 4. Black abalone size distributions by island. 1997 spring and fall samples.

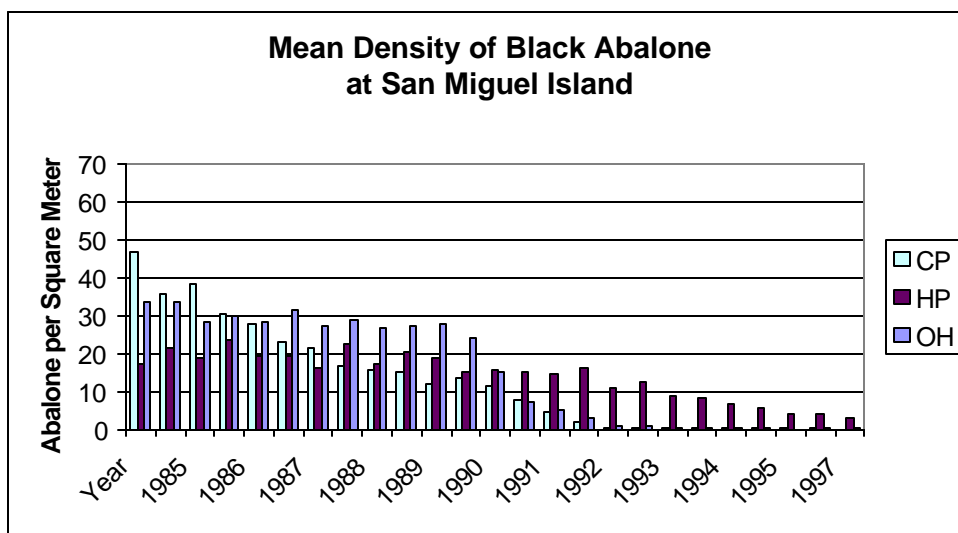


Figure 5. Black abalone density over time at San Miguel Island sites.

CP= Crook Point; HP= Harris Point; OH= Otter Harbor.

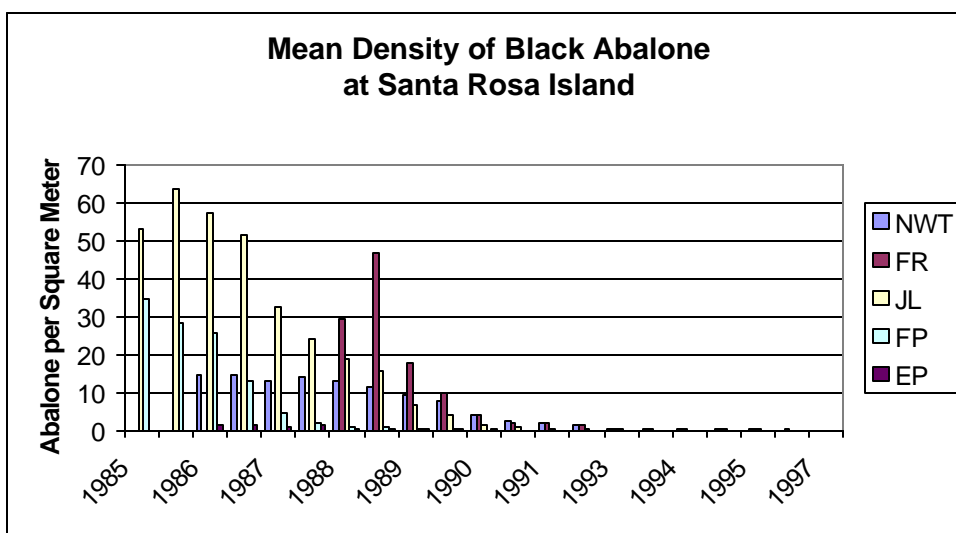


Figure 6. Black abalone density over time at Santa Rosa Island sites.

NWT= Northwest-Talcott; FR= Fossil Reef; JL= Johnson's Lee; FP= Ford Point; EP= East Point.

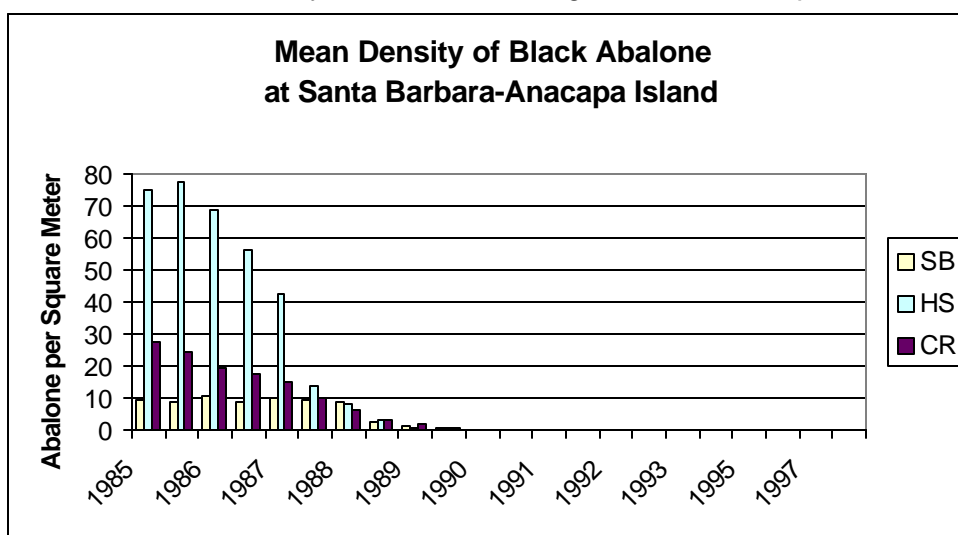


Figure 7. Black abalone density over time at Anacapa and Santa Barbara Island sites. SB= Sea Lion Rookery, Santa Barbara Is.; HS= Harbor Seal Arch, Anacapa; CR= Cat Rock, Anacapa.

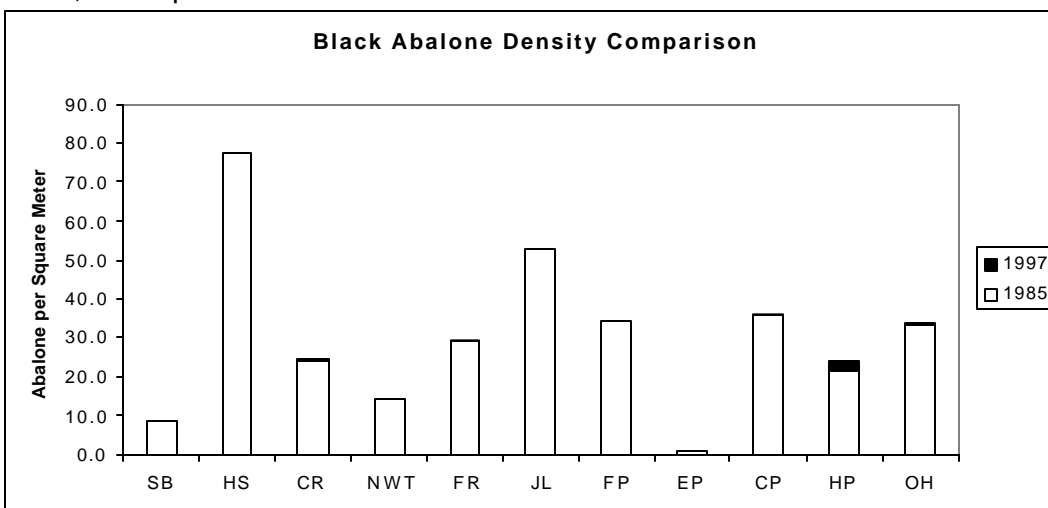


Figure 8. Black abalone density comparison between 1985 and 1997 by site.

Owl limpet densities declined at both San Miguel and Santa Rosa Islands in 1997 (Figures 9 & 10). Overall trends show a decline, ($r^2 = 0.4332$ at San Miguel and 0.4049 at Santa Rosa). Owl limpet monitoring at Northwest-Talcott began in 1993 and the lower density there drops the Island-wide density some but does not affect the overall trend much. The mean size at San Miguel declined slightly ($r^2 = 0.34$) but increased slightly ($r^2 = 0.1785$) at Santa Rosa Island. The larger sizes of the Santa Rosa Island owl limpet populations are evident in comparisons of size distributions between islands (Figure 11). Size distributions for each site are presented in trip reports (Appx. D).

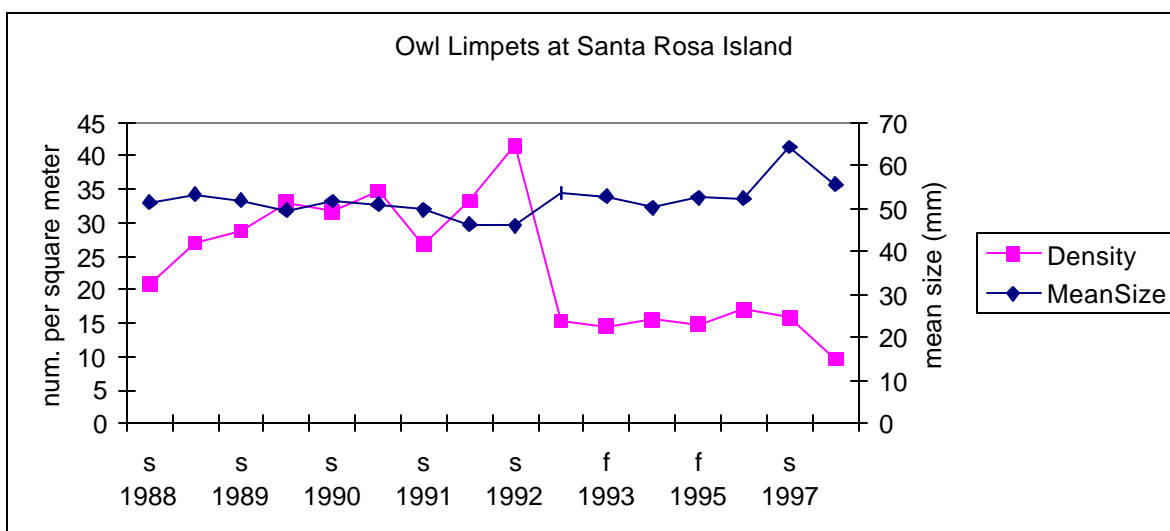


Figure 9. Owl limpet density and mean size from 1988 to 1997 at Santa Rosa Island.

(Data from Ford Point, Johnson's Lee, and Northwest Talcott combined, Northwest Talcott monitoring began in 1993)

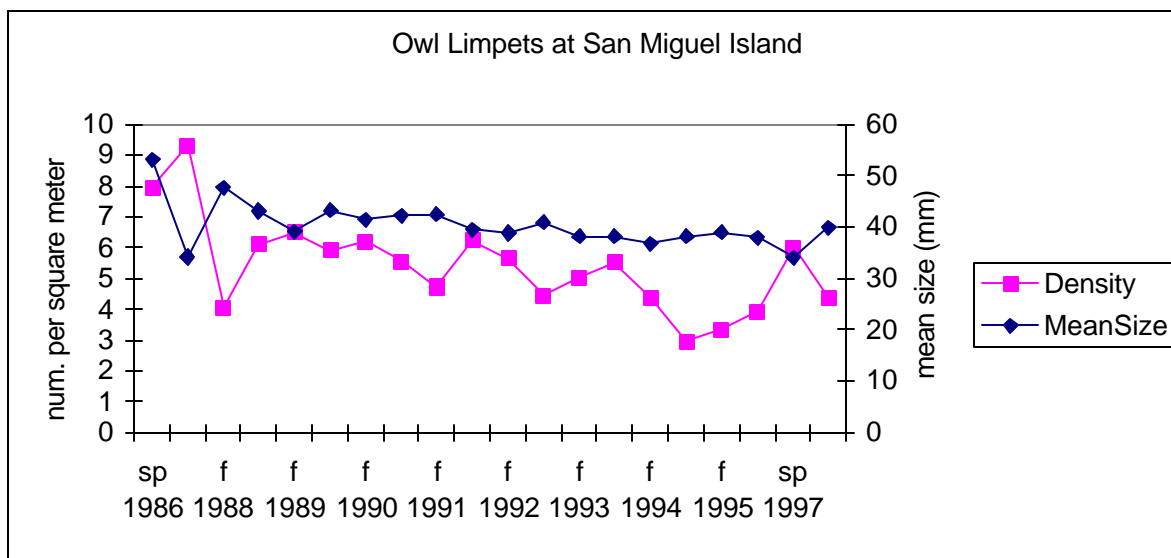


Figure 10. Owl limpet density and mean size between 1986 and 1997 at San Miguel Island.

(Data from Otter Harbor and Crook Point combined)

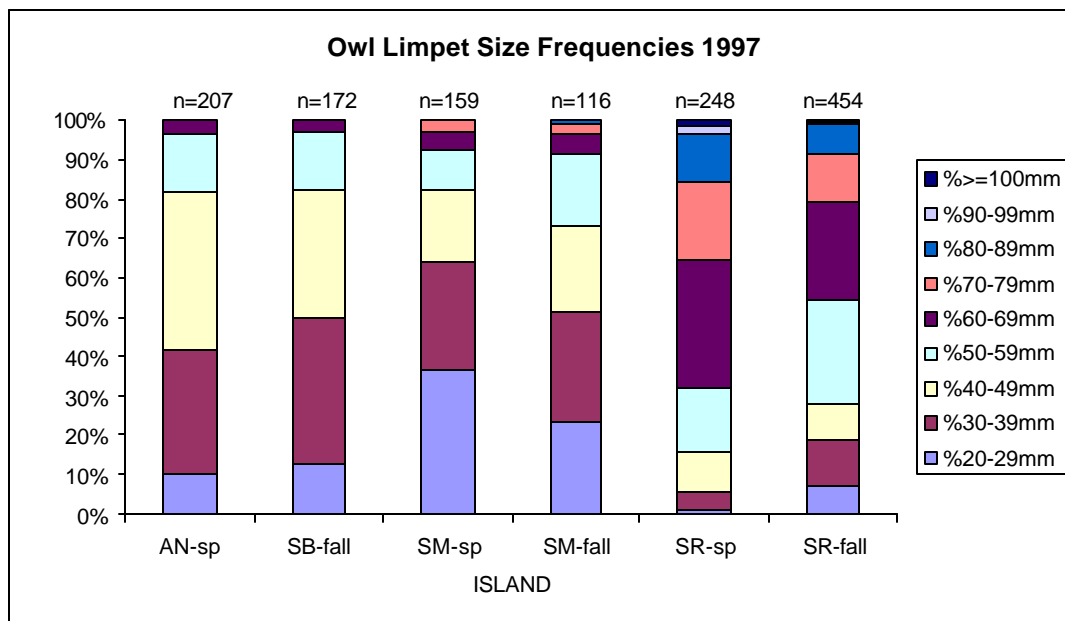


Figure 11. Owl limpet size distributions by island.

The temperature loggers generally worked fine (Figures 12-16). No data were available from Landing Cove or Crook Point however because of logger failure. More data will be available once the Access database is set up and all logger files have been imported.

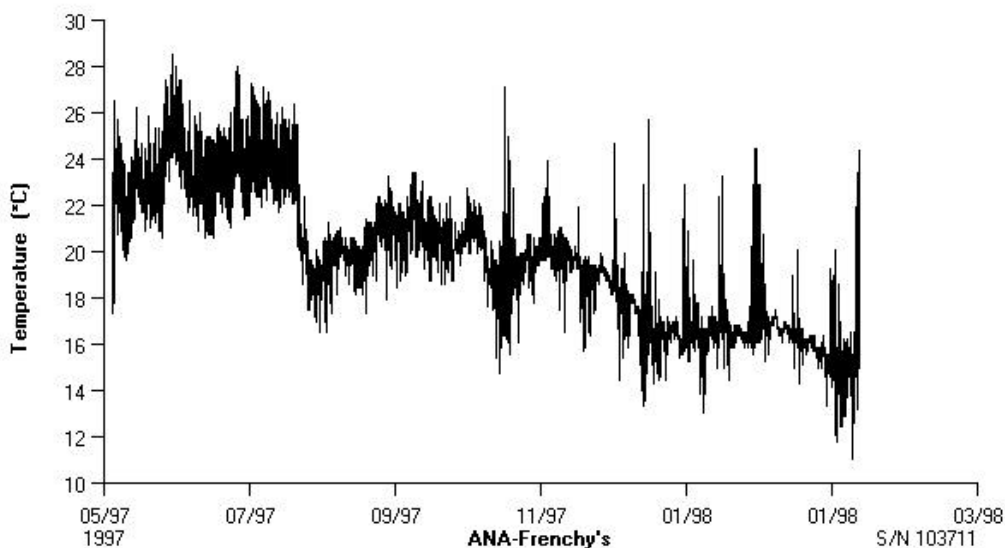


Figure 12. Temperature profiles from South Frenchy's Cove, Anacapa Island, May 1997-Feb. 1998

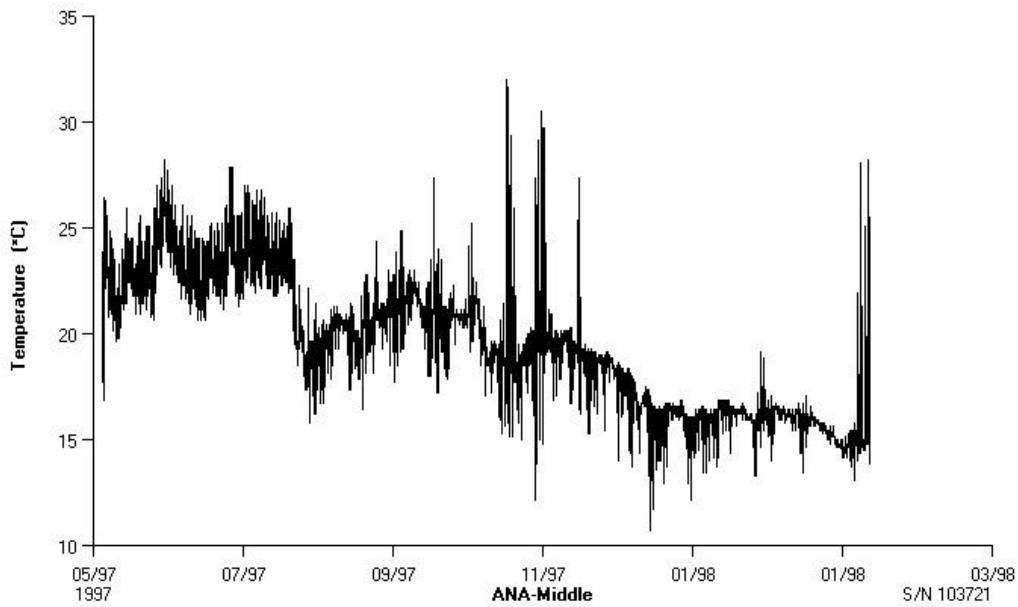


Figure 13. Temperature profiles from Middle Anacapa Island, May 1997-Feb. 1998

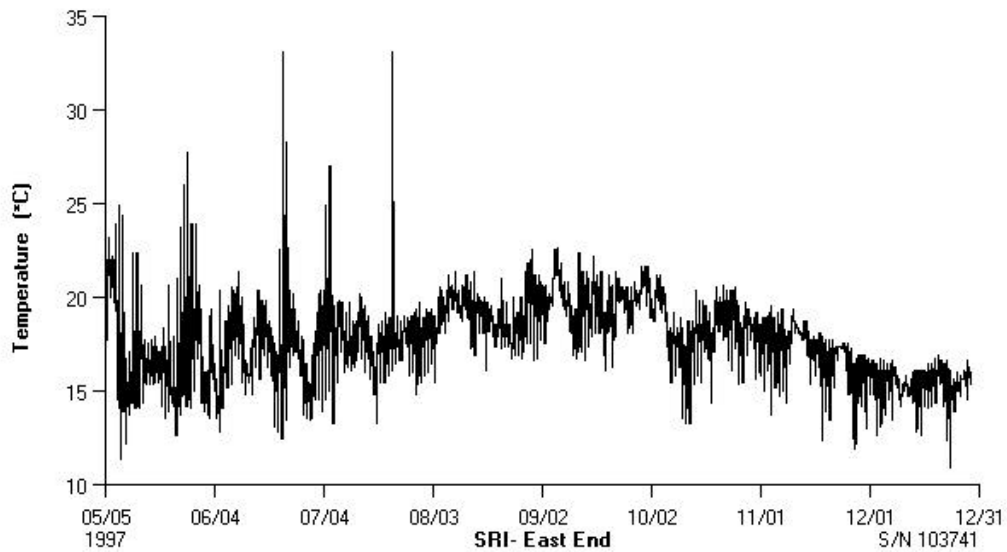


Figure 14. Temperature profiles from East Point, Santa Rosa Island, May-Dec. 1997

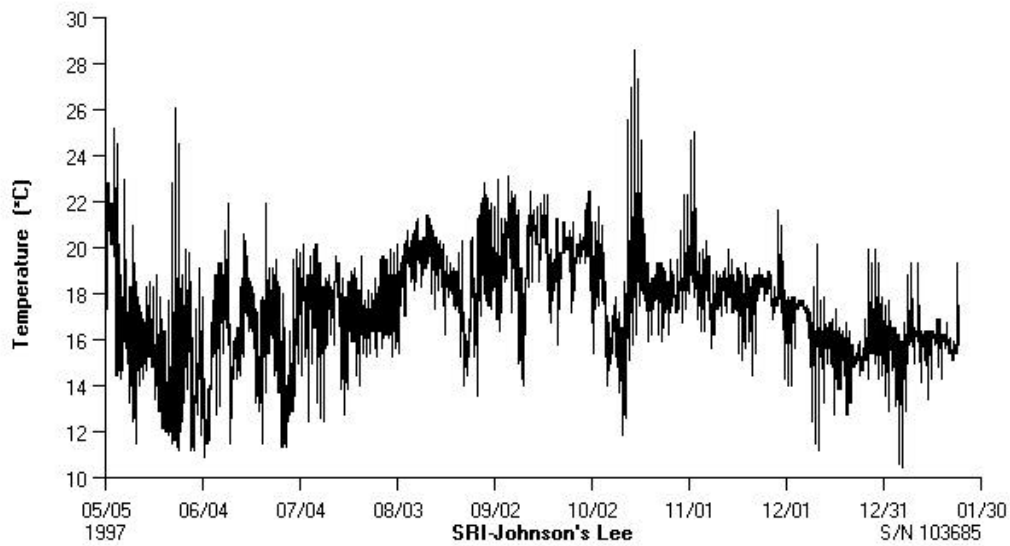


Figure 15. Temperature profiles from Johnson's Lee, Santa Rosa Island, May 1997-Jan. 1998

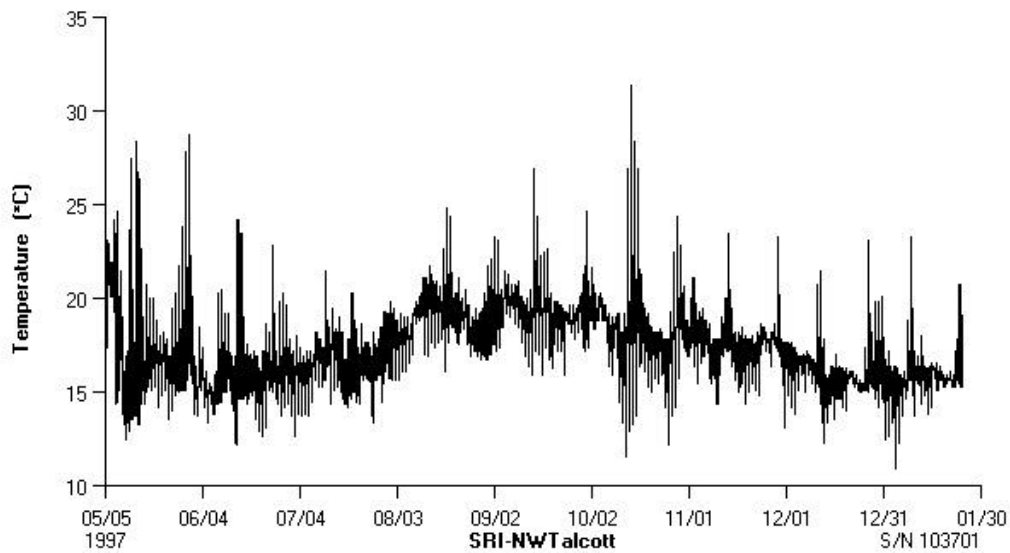


Figure 16. Temperature profiles from Northwest Talcott, Santa Rosa Island, May 1997-Jan. 1998

Visitor numbers for Frenchy's Cove are available from monthly reports based on concessionaire reporting (Table 2). Months with blanks are assumed to have no passengers at Frenchy's Cove. Anchorage counts of Frenchy's Cove are from counts conducted by NPS staff stationed on Anacapa Island as part of their daily routine and include the number of private boats. There is no record of the number of private boaters going ashore there.

Table 2. Visitors to Frenchy's Cove, Anacapa Island, in 1997. (See text for information sources)

MONTH	#PASSENGERS	#TRIPS	Pass/trip	Anchorage count
January	148	3	49.3	31
February	469	10	46.9	40
March	958	21	45.6	87
April	618	13	47.5	53
May	371	7	53.0	44
June	2	1	2.0	62
July	231	4	57.8	ND
August	391	6	65.2	91
September	0	0	0	74
October	0	0	0	44
November	84	3	28.0	ND
December	0	0	0	12

Discussion

There appear to be some consistent seasonal patterns at the San Miguel sites. Acorn barnacles and Endocladia declined noticeably between spring and fall samples at all four sites. Endocladia is towards the southern end of its range at the Channel Islands and the noticeable decline this year may be related to the strong El Niño event of 1997. Sharp declines in Endocladia were observed at Anacapa Island in 1983-84 during that El Niño. Cover of *Pelvetia* and *Hesperophycus*, which are towards the northern end of their range, increased between spring and fall samples. Rockweed at Harris Point is composed entirely of a short variety of *Hesperophycus harveyanus*, and cover there remained at the same level through the year. At Crook Point where both *Pelvetia fastigiata* and *Hesperophycus harveyanus* are common, rockweed cover only increased slightly. Mussel cover generally does not change because the animals are fairly long lived. At both Cuyler Harbor and Harris Point; however, mussel cover did decline about 4% in 1997.

Weather provided a few difficulties this year with rain and or high seas preventing most of the sampling in late fall. Unfortunately the early fall tides were not conducive to sampling. High surf prevented us from sampling the outer reef at Crook Point in November other than quick dashes to photograph plots. High seas also prevented us from landing at Harbor Seal Arch abalone plots and the eastern portion of Middle Anacapa in March.

Counting motile invertebrates in the plots turned out to be quite a chore, as one finds upon close inspection, many more small animals than were suspected. As with many sampling methods, no one plot size is ideal for all species. In general, a 50 x 50 cm plot should provide reasonable numbers of most species (adequate for a sample without overtaxing the observer for most species). For some plots, littorine snails need to be subsampled, preferably in a 10 x 10 cm plot. Subsampling may be preferable for small limpets as they are numerous and cryptic enough that a small search area would improve the accuracy. Having a quadrat frame that is divided into (4 to 10) smaller squares would make the counting easier and probably more accurate. Some generalizations can be made about the zonation of the invertebrates. Littorines tend to be more numerous in barnacle plots, though at some San Miguel sites they were more numerous in rockweed plots. The chiton *Lepidochitona hartwegii* is more numerous in rockweed plots. Predatory snails, especially *Nucella emarginata*, are more common in mussel plots. Small limpets were common throughout the range of zones.

Examples of temperature information are presented in Figures 12-16. There is still additional work to be done in establishing the database and presentation. Because the housings are exposed to air and sometimes the sun during low tide, there are anomalous spikes in the maximum and possibly minimum temperatures. The information will be very useful in comparing oceanographic regimes at the different sites and seasons. Loggers are in place on each side of the each island except Santa Barbara where only the east side of the island is accessible.

Visitation figures (Table 1) show that 74% (2,416 of 3,272 total visitors) of the yearly visitation to Frenchy's Cove, Anacapa occurred during the months of February, March, April and May. This seems to be the typical pattern for most years. School groups seem to be the most common groups visiting the tidepools at South Frenchy's Cove. The fall

tides in 1997 were not as convenient for visitation as some years (either being later in the day or just barely minus tide levels on the spring tide series) and this may have affected some of the fall visitation. The four spring months had an average of 604 visitors per month. March had the most visitation with 958 passengers on 21 trips. Surprisingly this compares fairly closely to Cabrillo National Monument in San Diego, California where an average of 63 visitors were counted in the intertidal zone within 30 minutes of daytime low tides (Engle and Davis 1996). The actual number of visitors over the course of the day and number of accessible days each month would naturally be higher at Cabrillo because visitors would not have to wait for the boat or be as constrained by weather compared to Anacapa Island. Limited visitation was suggested for Anacapa of not more than 100 visitors on any one day or more than 500 visitors during one month. This policy needs to be reviewed.

Determining the actual damage done by visitation will require further analysis of the data. Except for littorine snails, motile invertebrate counts at South Frenchy's Cove were lower than Middle Anacapa or Cat Rock. However, finding direct cause and effects of visitation at Frenchy's Cove is difficult because many of the groups actually pass right by the South Frenchy's Cove site to visit the area know as the Blow Hole, located on the next point to the west. Based on results of experimental trampling and scrape plots at Cat Rock recovery in both the rockweed and mussel zones can take many years (Richards 1994).

Extrapolating recovery rates from the experimental plots to other sites may not be applicable either. Recovery of mussel damage in the scraped plots was slower at Cat Rock than in clearings caused by debris in fall 1985 at Landing Cove, Santa Barbara Island (Richards 1994). Mussel cover in the Cat Rock scraped plots still has not rebounded to the level of the control plots. Mussel cover in trampled plots was actually slightly higher in spring 1997 than in control plots. Scraped mussel plots average 22.3% mussel cover and 16.3 species per plot. Trampled plots averaged 39.6% mussel cover and 16.3 species per plot. The control plots averaged 37.3% mussel cover and 17.3 species per plot. South Frenchy's Cove mussel plots averaged 72.4% mussel cover and 17.6 species per plot. Mussels at both sites are generally small compared to some other sites. At Cat Rock, there tends to be a lot of open areas with bare or coralline algae

covered rock exposed. In contrast, mussel plots at Santa Barbara Island are often several layers deep. The epoxy corners there had to be replaced with six-inch bolts so that the plots could be relocated.

Many of the plots at Sea Lion Rookery, Santa Barbara Island show declines in the target species cover, coupled with increases in miscellaneous algae. From personal observation, I would attribute the damage to increased activity of California sea lions, which haul out on the rocks there. Much of the damage to intertidal organisms is physical from the animals dragging their bodies over the rocks. I suspect there may be some chemical impact from the sea lions defecating on the upper reef.

In February 1997, a workshop was held at University of California, Santa Barbara to discuss recommendations for establishing a multi-agency rocky intertidal network. Fifty-one invited scientists attended. There are 59 monitoring sites being monitored, with 49 sites using similar methods based on the protocol used at Channel Islands National Park (Engle et al. 1997). A joint paper (Dunaway et al. 1997) presented at the California and the World Oceans Conference in San Diego followed this. Some of the key advantages we outlined for establishing a monitoring network were: 1) increasing the reliability, efficiency, and cost-effectiveness of programs; 2) enhanced long-term support of to ensure cost-effectiveness of programs; 3) evaluation of large scale patterns; 4) provide better analysis, synthesis and reporting of data. In June, the network (Multi-Agency Rocky Intertidal Network -MARINE) was formed and the first meeting of the steering committee was held. The goals of MARINE are: 1) to support continuous long-term monitoring of rocky intertidal communities in the Southern California Bight. 2) To maximize coordination and communication among sponsoring groups. 3) To increase access to the data collected for all users. 4) To integrate intertidal surveys with other research efforts. 5) To address questions which cannot be answered by individual projects.

Recommendations for Monitoring:

Jack Engle and crew from U. C. Santa Barbara under contract to the California Coastal Commission established sites on Santa Cruz Island in 1992. Permanent sites are located at Scorpion Rock, Prisoner' Harbor, Orizaba, Frazer Cove, Forney's, and Willow Cove. Funding for monitoring sites was available only through spring 1998. Santa Cruz

Island is in a location in the middle of the northern islands. Most oil spill models project the most significant impacts of a spill to occur at Santa Cruz Island. These sites need to be added to the Channel Islands National Park monitoring program. This can be accomplished without significant impacts to the existing program by either sampling during tide series outside the normal sampling period, dropping back to once a year at some of the existing sites, or purchasing a set of backup equipment and "borrowing" biologists from the Kelp Forest Monitoring program. We need backup gear for the program anyway after a camera and strobes were lost in a surge channel in 1996. The use of additional tide series and going to once a year sampling are being discussed in the MARINE Science Panel. One of the reasons we have discussed reducing sampling frequency to once a year is to make time to sample additional sites or to do more directed monitoring at the existing sites.

The intertidal monitoring program needs to undergo a formal review to assess the protocol and results in their ability to meet management goals. Further analyses of the data are needed (including power analysis) to check the value of the data set and to look at seasonal trends in regards to sampling frequency. Support and participation in MARINE can increase the strength of the data by combining with other data sets in southern California.

Recommendations for Management:

Channel Islands National Park needs to be a participant in practice oil spill drills held by the Minerals Management Service to see where problems lie in managing a spill before it happens. The Park should convene a meeting of managers and biologists to discuss our priorities for assessment and monitoring at the islands in case of an oil spill. The current monitoring program will provide important baseline information useful in assessing the impacts of a spill, but there may be specific places or impacts that are important but not covered. There is also value in on-site monitoring to record when and where oil comes ashore during a spill. One concern is that oil may impact an area, then be cleaned out by the tide. Resource impacts can occur but not be noticeable during initial assessments with the cause being unclear later. Having clear priorities and goals will help us be prepared with the proper equipment and will save time in the crucial first hours of a spill.

Several recommendations were developed after participating in the September 29th oil spill from Platform Irene, just north of Point Conception. From a biological standpoint, we should consider which areas of the islands are our highest priorities for surveys in case of impending impacts and whom we will allow to help with the observations. We need to know who is most familiar with the island coastlines so they can act as team leaders. Documenting all observations on video tape works well and provides a good record of events as they unfold. Video has many advantages over still photography for this purpose. NOAA/NRDA (Natural Resources Damage Assessment) apparently has guidelines for this and the park needs to follow these if possible. NOAA also has guidelines for describing oil so that we can be consistent. Proper collecting procedures, chain of command protocol, and note taking procedures need to be outlined and available to staff working a spill. Brief training on use of cameras, things to look for, and proper procedures are needed.

Some logistical needs include supplies for collecting oil samples and oiled birds. These include Nitral groves, glass sample jars and wooden tongue depressors for collecting oil. More video cameras and cell phones should be available. One of the problems encountered with the Irene spill was the lack of charged video batteries. Equipment and batteries need to be kept in a state of readiness. Field personnel need to keep field clothes and minimal overnight supplies at work for immediate deployment.

Acknowledgments

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Taniguchi from CDFG have been generous with sharing their data, ideas, and time. Valerie Bryson of Computer Ease worked wonders with converting the database and solving problems. Gary Davis and Kevin Lafferty provided critical review of this manuscript. Thanks also to Mary-Elaine Dunaway and crew from MMS for allowing me to participate with monitoring on Vandenberg AFB. Seeing other sites and discussing variations in techniques helps to bring perspective to the islands' place in southern California ecology and bring about improvements in the monitoring programs of both agencies. Carol Thornber and Annette Sanders helped out at Anacapa Island. Ian Taniguchi of CDFG helped with Santa Rosa and Ian Williams joined us for the monitoring at San Miguel. All of their efforts are appreciated.

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Appendix A. Percent Cover Data

Percent cover of selected taxa in fixed 50 x 75 cm photoquadrats based on 100 points per plot. Means and standard deviation are given for each zone.

Note: All photoplots were scored in the field with the exception of all plots from Middle-West on 3/6/97, plot 428 from Harris Point on 2/3/97, and plots 384, 385, 386, 387, 388, 399, & 400 from Crook Point on 11/14/97.

Appendix B. Photoplot Species Census

Presence/absence of species within photoplots were noted.

X designates the species presence in that plot.

? indicates identification of that species was not positive.

Numbers indicate the actual number of that species found in the plot (also used in the motile invertebrate count).

The San Miguel Island sites in fall, were scored for relative abundance. At those sites 0=notably absent, R= rare, P= present, C= common, A= abundant, X = present but abundance ranking not given.

E indicates eggs of that species present.

Appendix C. General Species List

The species list contains presence/absence and relative abundance data for all species found at a site during the regular visit. Relative abundances are subjective, relative to the entire site accounting for the appropriate habitat and based on observers' knowledge of general abundance at the Channel Islands. The time allotted to general species information gathering varied greatly, and in 1997 generally consisted of observations made during plot censuses with a brief look around while on site with little time specifically devoted to searching for species. No general species list was made at Middle Anacapa, Ford Point, or Fossil Reef in 1997.

Abundance Ratings:

X - present, no relative abundance rating given

4 - abundant, organism present in higher than normal densities

3 - common, organism found over most of the site or in high density patches

2 - present, organism found in moderate numbers

1 - rare, few organisms found

0 - noticeably absent, an effort was made to look for an organism that was not found

Blanks indicate the species was not noticed, however the absence was not confirmed.

Notes: E eggs D drift S shell only

Site Code	Site Name	Island
SMCH	Cuyler Harbor	San Miguel
SMCP	Crook Point	San Miguel
SMOH	Otter Harbor	San Miguel
SMHP	Harris Point	San Miguel
SMWC	Willow Canyon	San Miguel
SMLP	Leuzarder Point	San Miguel
SREP	East Point	Santa Rosa
SRJL	Johnson's Lee	Santa Rosa
SRNW	Northwest-Talcott	Santa Rosa
ANSFC	South Frenchy's Cove	Anacapa
ANCR	Cat Rock	Anacapa
SBLC	Landing Cove	Santa Barbara

SBSLR | Sea Lion Rookery | Santa Barbara

Appendix D. Trip Reports

The following are trip reports from the monitoring events in 1997.

San Miguel Island, February 3, 1997

(Database event # 9701)

PURPOSE: To monitor rocky intertidal sites on San Miguel Island and participate in red abalone surveys with California Dept. of Fish and Game.

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
(David Kushner, CINP and CDFG biologists conducted subtidal abalone surveys only)

PROCEDURE: David Kushner and I joined the R/V MAKO February 1 in Santa Barbara. When conditions allowed, our goal was to conduct transects in red abalone habitats, counting and measuring all abalone encountered. Shells were collected and a random sampling was brought back to the ship for sex determination. I went ashore to conduct intertidal monitoring on Feb. 3, but weather forced us to depart the island the next day. The weather has not been cooperative this winter and three separate attempts to get there were canceled.

RESULTS: Red abalone were found in greater numbers than expected, however, only a small percentage were commercially legal sized. The sex of the abalone was difficult to determine from the gonad color so some animals were sacrificed for further study. If we were correct, the vast majority of the abalone at San Miguel are females. Many empty fresh shells were found in the Wyckoff Ledge area and may indicate high mortality from Withering Syndrome, though few withered abalone were found. The Fish and Game Cruise Report has more complete red abalone data.

Harris Point, low tide -0.2 ft @ 1317 hrs, clear sky, wind 10+ NW, surge heavy, air 14° C water 14°C. Arrived on site about 1015, three harbor seals present. A couple of black oystercatchers were observed flying over but did not land on rocks at site. Several elephant seals on Secret Beach. Coreopsis was not yet in bloom. Island wallflower, snakeroot, and *Castilleja* spp. were blooming.

Despite the surge on the outer shore, the tide was very workable. I worked alone and completed photos, scoring, species census of photoplots, abalone plots, and sea star transect. The strobes were not working properly and most of the plots were shot without strobes at f/11, a few plots in shadow were reshot with one strobe. It was noted that a previous repair to plot 424 had the alignment wrong. The old corners were found and the new corners were removed to prevent future confusion.

Table 3. Photoplot summary- mean percent cover by zone Harris Point, February 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
HP	Barnacle	49.8	26	1.8	0	8.6	11.2	2.6	0
HP	Endocladia	28.6	8.4	47.4	6.8	2.4	6.4	0	0
HP	Rockweed	40.4	3.6	11.6	34.4	7.2	2.6	0.2	0
HP	Mussel	29.4	4.8	1.6	0.2	35.2	7.8	1	0

A total of 69 black abalone were present in the five plots.

Table 4. Black abalone abundance in monitoring plots at Harris Point.

Plot #	441	442	443	444	445
# abalone	35	15	10	4	5

Before the tide became a factor, 43 black abalone were measured outside the fixed plots. More abalone were present. All together the range was 44-146 mm. There was also a fair number of empty shells around the site. I found one abalone with symptoms of withering syndrome, green foot color, moderately shrunken, easily pulled off by hand. It was in the open on top of a boulder, this often seems to be the case with weak abalone. The sea star transect (crevice) had six black abalone and six *Pisaster ochraceus* present. *P. ochraceus* were present in low numbers scattered around the site.

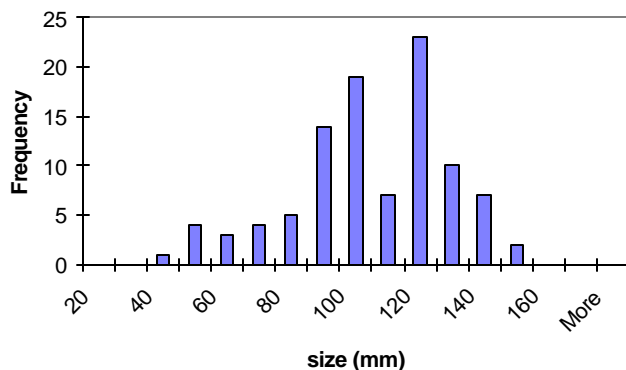


Figure 17. Black abalone size distribution at Harris Point, San Miguel Island

Black turban snails, *Tegula funebris*, were present in all the abalone plots. Several *Tegula gallina* were noticed in plot 445. Purple sea urchins were fairly abundant in plot 444. Plot 444 also had fairly abundant aggregating anemone, *Anthopleura elegantissima*, in the upper left portion of the plot. Red mites seemed to be quite common.

We felt landing by Crook Point was not a good idea on 2/4, and in fact departed San Miguel that afternoon because of the weather.

San Miguel Island, April 1-8, 1997

(Database event #9704)

PURPOSE: To monitor rocky intertidal sites at Otter Harbor, Cuyler Harbor, and Crook Point, and download temperature loggers from Harris Point and Crook Point. Count motile invertebrates and gather additional size frequency information on black abalone. Collect withered abalone for Fish and Game.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park

PROCEDURE: Flew out via CIA-Islander on 4/1. I arrived too late for the low tide so helped Marc Linder bash mustard and curly dock weeds around the Lester Ranch site.

Each of the 20 photoplots at each site was photographed, scored in the field using the string quadrat, a detailed species list was made of all species found inside the plot, and motile invertebrates were counted using the upper left 25 x 25 cm area of each plot for *Littorina* spp. (littorine snails) and *Collisella* spp. (limpets) and a 50 x 50 cm area for other gastropods, chitons, owl limpets, and sea urchins. Black Abalone, *Haliotis cracherodii*, were counted and measured within plots at Crook Point and Otter Harbor. Owl limpets, *Lottia gigantea*, were measured within three permanent abalone plots at Otter Harbor and three abalone plots at Crook Point. Thirty-minute random searches were made for black abalone and sea stars at Cuyler Harbor, Otter Harbor, Crook Point, and Harris Point. Repairs were made to epoxy corners as needed. Additionally, each site was video taped with emphasis on overall characteristic, general zonation, and abalone abundance. Abalone searches were made at Willow Canyon.

RESULTS:

Cuyler Harbor: April 2, partly cloudy, air 15.5°C, water 13°C, Wind-10 NW, surge heavy, Low tide -0.2 ft @1213.

Along the beach, between Gull Rock and the site, were 8 elephant seal pups, 6 black oystercatchers, 15 western gulls, and 1 Heermann's gull. There were at least 30 surf scoters in the harbor. The sand level made it impossible to go over the middle rocks so I had to go over the dune to get around. Bumblebees were active on the slope. There were a considerable number of fresh tar balls on the beach. On the east end of the beach, there was abundant kelp wrack with lots of beetle, fly, and amphipod activity. There were no snowy plovers present.

Sandcastle worms, *Phragmatopoma californica*, were abundant. Rockweed, *Pelvetia fastigiata* was fairly lush, *Hesperophycus harveyanus* was present but only in small numbers. The lower zones of red algae, *Gigartina canaliculata* and *G. spinosa* were lush. *Chthamalus fissus/dalli* was abundant and dominant in most of the barnacle plots, but *Balanus glandula* was dominant in plot 412 (an Endocladia plot). There were several small patches of fresh tar on the reef.

Dan made a 20-minute search for sea stars, covering the entire site finding 10 ochre stars, *Pisaster ochraceus*. Only one black abalone was found - a 25 mm individual in one

of the mussel plots. All the plots were scored and censused, but invertebrate counts were only completed in 15 plots because of the tide.

Table 5. Photoplot summary - mean percent cover by zone at Cuyler Harbor, April 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussel	MiscAlga	MiscAnimal	Tar
CH	Barnacle	49.0	47.8	2.8	0.0	0.2	0.0	0.0	0.0
CH	Endocladia	36.0	14.8	42.8	1.4	1.6	1.8	1.6	0.0
CH	Rockweed	18.8	0.8	0.4	69.6	0.0	7.0	4.0	0.0
CH	Mussel	29.4	10.8	0.0	0.0	39.8	5.6	14.4	0.0

Crook Point: April 3, clear calm conditions, air 21°C water 13.5°C, moderate surge, low tide -0.4 ft @ 1258.

Birds observed at the site: 3 pelagic cormorants, 11 Brandt's cormorants, 2 black oystercatchers, 1 willet, and 1 black turnstone. There were 6 elephant seals in the surge channel at the site and 35 on the adjacent beach to the east.

The site appeared quite lush, with algae doing well all over the reef. *Chaetomorpha linum*, *Cladophora columbiana*, *Ulva sp.*, and *Enteromorpha sp.* were all quite common on the reef top. This seems to be a very good year for *Porphyra perforata* as it was common at all the sites this week. *Polysiphonia sp.*, *Mastocarpus papillatus*, *Gastroclonium coulteri*, *Cladophora microcladioides*, and *Gigartina spp.* were common to abundant along the surge channel walls. I discovered three plants of *Analipus japonicus* and was able to finally make a collection. I have found this brown alga here before, but it has never been officially documented at the islands.

Several lined chitons, *Tonicella lineata* were observed. Rock isopods, *Ligia occidentalis* were common with some large individuals present. Purple urchins, *Strongylocentrotus purpuratus* were common in all the pools, almost all in burrows in the soft rock here. A few were seen with short spines or bare spots, but it was not clear if it was disease or just wear from rubbing against rocks. Copepods, *Tigriopus californicus*, were abundant in some of the upper pools. The temperature in one of those pools was measured at 25 °C.

I was able to complete all of the photoplot work including counting invertebrates. The temperature logger was downloaded.

Table 6. Photoplot summary - mean percent cover by zone at Crook Point, April 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussel	MiscAlga	MiscAnimal	Tar
CP	Barnacle	58.8	38.4	1.8	0.0	0.6	0.4	0.0	0.0
CP	Endocladia	44.6	3.4	36.4	5.0	4.6	5.0	1.0	0.0
CP	Rockweed	40.8	0.8	15.2	12.8	16.8	11.8	1.8	0.0
CP	Mussel	9.8	0.4	0.2	0.0	79.8	5.2	4.6	0.0

Three black abalone were found in plot 394 (64,65,75 mm). I conducted a 30 minute search measuring 27 black abalone and counting 70 *Pisaster ochraceus* and one *Pycnopodia helianthoides*. Seven ochre stars were found in the abalone plots. (Black abalone: n=31, average = 87.3 mm, stddev = 34.4)

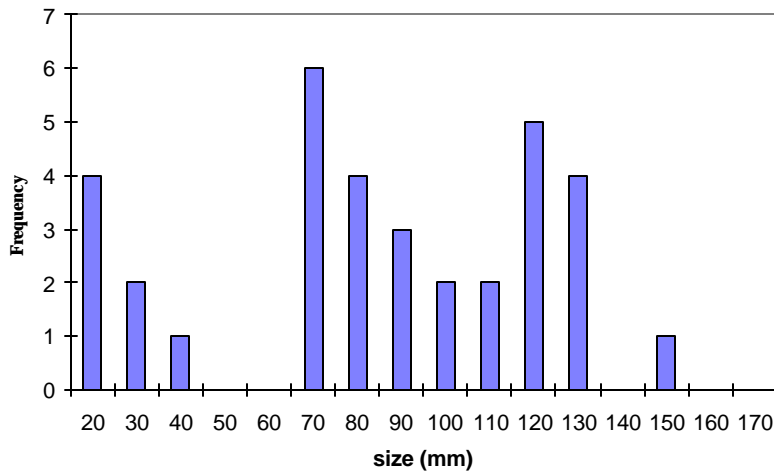


Figure 18. Black abalone size distribution at Crook Point, San Miguel Island

I measured 45 mussels that were dislodged when clearing the photoplot corners. (n=45, average = 19.1mm, stddev=9.6). Mussels at Crook Point were much smaller than at Cuyler Harbor.

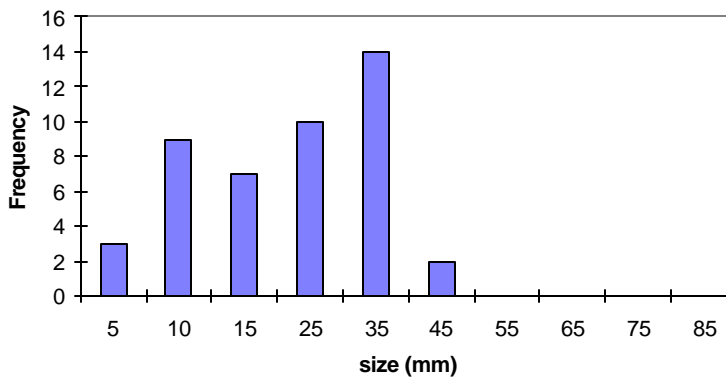


Figure 19. California mussel size distribution at Crook Point, San Miguel Island

Table 7. Motile invertebrate counts from photoplots at Crook Point.

event 9704
Crook Point, SMI
4/3/97

zone	Plot number	<i>Tegula</i> <i>funnebralis</i>	# <i>Littorina</i> sp.	# <i>Acanthina</i> sp.	# <i>Ocenebra</i> <i>circumtexta</i>	# <i>Nucella</i> <i>emarginata</i>	# Limpets	# <i>Fissurella</i> <i>volcano</i>	# <i>Lottia</i> <i>gigantea</i>	# <i>Lepido-</i> <i>chitona</i> sp.	# <i>Nuttallina</i> sp.	Other species
Barnacle	137	0	44	0	0	0	1	0	0	0	0	
Barnacle	147	0	159	0	0	0	0	0	0	0	0	
Barnacle	148	0	9	0	0	0	0	0	0	0	0	
Barnacle	149	0	109	0	0	0	30	0	0	0	0	
Barnacle	150	0	142	0	0	0	26	0	0	0	0	
Mussel	381	0	3	0	0	2	33	0	3	1	2	
Mussel	382	8	2	0	0	1	13	0	0	0	1	
Mussel	383	1	0	0	0	0	0	0	0	0	0	
Mussel	384	0	1	0	0	0	15	0	0	2	0	<i>S. purpuratus</i> -1
Mussel	385	0	0	0	0	1	42	0	0	0	1	<i>S. purpuratus</i> -3
Endocladia	386	0	70	0	0	0	50	0	0	0	0	
Endocladia	387	0	1	0	0	1	69	0	0	0	0	
Endocladia	388	0	105	0	0	0	54	0	0	0	0	
Endocladia	389	0	32	0	0	0	20	0	0	2	2	
Endocladia	390	0	91	0	0	0	83	0	0	1	0	
Rockweed	396	0	113	0	0	0	22	0	0	1	1	
Rockweed	397	2	3	0	0	0	30	0	0	1	0	
Rockweed	398	0	6	0	0	0	47	0	0	2	0	
Rockweed	399	0	23	0	0	1	26	0	0	1	2	
Rockweed	400	0	16	0	0	0	50	0	0	0	0	

Otter Harbor: April 4, 1997 foggy, cool light breeze, air 18°C, water 13°C, moderate surge, low tide -0.5 ft @ 1340

April 5, partly cloudy, warm, calm, moderate surge, low tide -0.5 ft @ 1419.

At the site and adjoining reef were two black oystercatchers, 100 willets, approx. 30 western gulls, a few pelagic and Brandt's cormorants, and eight black turnstones. There were seven harbor seals (incl. 2 pups) present on the 4th and 19 on the 5th (I arrived later in the tide on the 5th). Approximately 100 elephant seals of mixed ages were on the pocket beach to the east. While working one of the lower plots, a young harbor seal crawled up onto the reef and right over to me. It checked me out, then casually went back into the water.

Endocladia muricata and *Pelvetia fastigiata* were abundant. *Hesperophycus harveyanus* was present in a very narrow band above the *Pelvetia*. Immature *Rhodoglossum affine* and/or *Mastocarpus papillatus* was both extensive and very lush forming wide bands and covering the wall where barnacle plot 274 and abalone plot 365 are. Mussel coverage

was high. *Balanus glandula* was the dominant barnacle in the barnacle plots. Copepods and cyanobacteria were both abundant in the splash zone. Large file limpets (*Collisella limatula*) seem especially large and common along this stretch of coast. I measured 54 in one area ranging from 14 - 34 mm.

Table 8. Photoplot summary - mean percent cover by zone at Otter Harbor, April 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussel	MiscAlga	MiscAnimal	Tar
OH	Barnacle	35.0	35.0	0.0	0.0	0.0	26.8	0.6	2.6
OH	Endocladia	26.0	4.0	40.8	16.2	0.6	12.0	0.4	0.0
OH	Rockweed	30.0	12.6	21.6	29.2	0.0	3.2	0.0	3.4
OH	Mussel	19.0	1.4	0.4	0.0	64.6	9.0	5.6	0.0

California mussels, *Mytilus californianus*, pulled up to clear the plot corners were measured for size frequency (n=38, average=37.7mm, stddev=21.7)

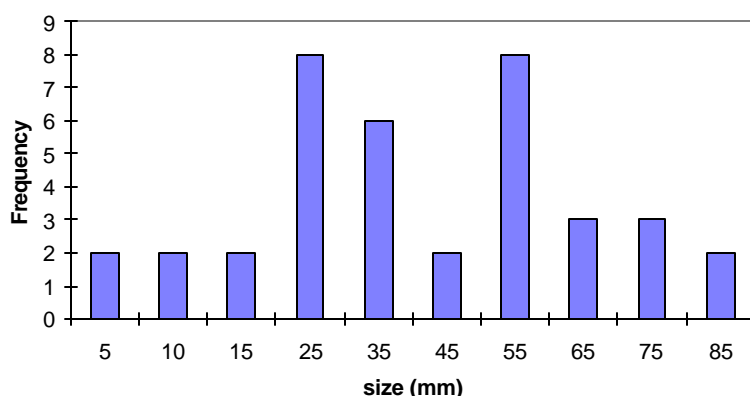


Figure 20. California mussel size distribution at Otter Harbor, San Miguel Island

Owl limpets seemed less abundant on open faces of large rocks, but small owl limpets were common in the mussel bed (plot 369).

Table 9. Owl limpet number and sizes from Otter Harbor.

	Plot 496	plot 368	plot 369
Number	12	33	114
Mean size (mm)	40.8	35.5	32.8
Std Deviation	16.3	15.7	13.5

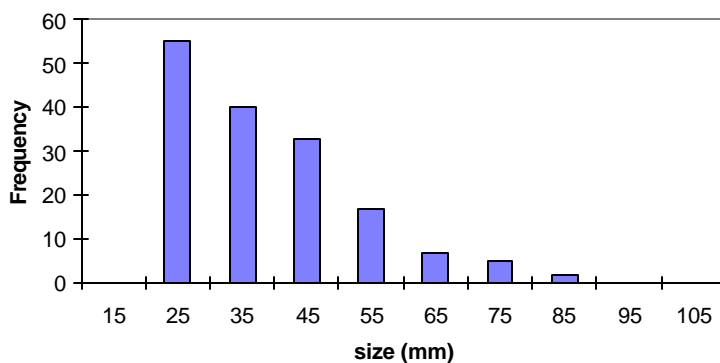


Figure 21. Owl Limpet size distribution at Otter Harbor, San Miguel Island

Sear stars were counted during a 30 minute search for abalone and 32 *Pisaster ochraceus* and 3 *P. giganteus* were found.

Black abalone were common in low numbers throughout the site. While some large abalone were found, the overall population seems to have shifted with smaller abalone forming the bulk of the population. Abalone are not found lining the walls of the surge channel any more and in fact are found, almost exclusively, cryptically hidden in small cracks and crevices. There were five black abalone in plot 369. I conducted a 30 minute search finding 86, then measured an additional 30 after the 30 minutes. Seven fresh black abalone shells (36-89 mm), 24 old black abalone shells (19-80 mm), and 1 fresh red abalone shell (53 mm) were found.

I measured black abalone on reefs to the northwest near N. Green Mtn. Canyon and on the reef where the F/V Haithuan ran aground several years ago (about 400 m east of the monitoring site). On the N. Green Mtn Cyn reef I measured 73 abalone in 45 minutes, and on the Haithuan reef, I measured 38 abalone in 15 minutes. I also found two fresh shells (164 and 135 mm) and one withered abalone at the later reef.

Table 10. Black abalone numbers and sizes from Otter Harbor and area.

	All areas	Monitoring site	N. Green Mtn Cyn	Haithuan reef
Number	232	116	73	38
Mean size (mm)	90.7	89.4	83.6	111.8
Std Deviation	31.5	27.6	33.7	28.8

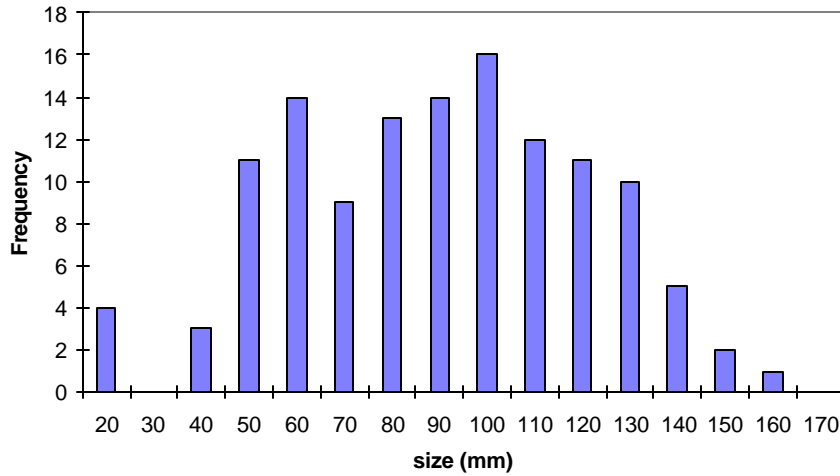


Figure 22. Black abalone size distribution at Otter Harbor, San Miguel Island.

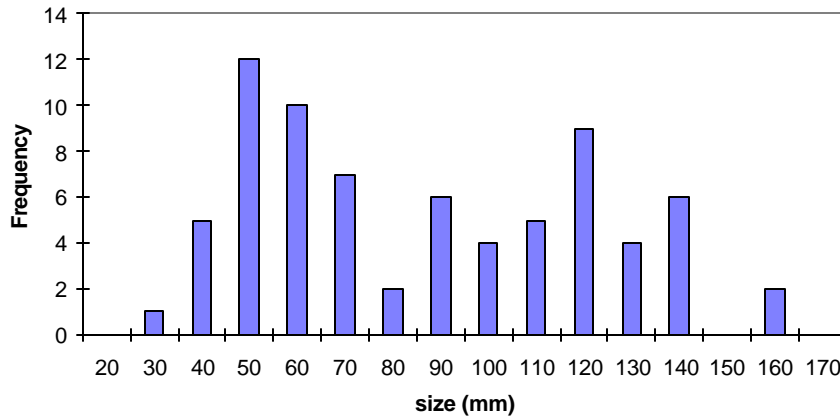


Figure 23. Black abalone size distribution at North Green Mtn. Canyon, San Miguel Island

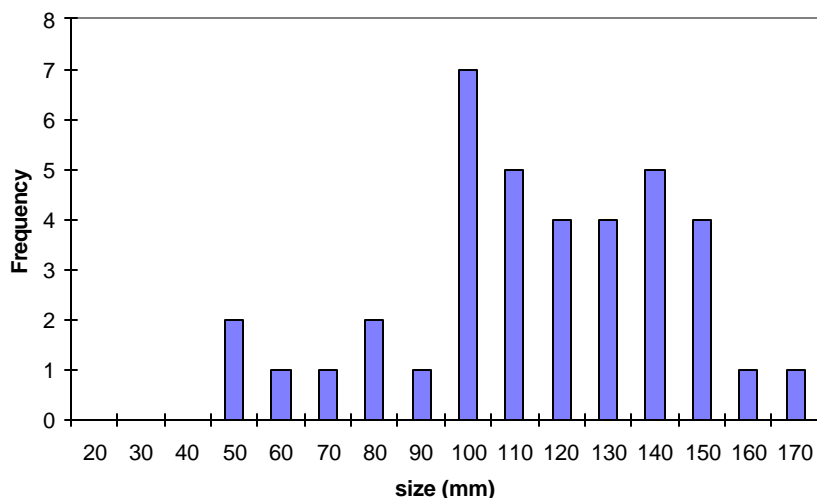


Figure 24. Black abalone size distribution at Haithuan Reef, San Miguel Island

Harris Point: April 6, clear and breezy conditions, Air 14.5°C Water 14°C, wind 15 NW, light surge, tide level -0.3 ft @ 1556.

Two black oystercatchers were at the site. Several pelagic cormorants were nesting on the cliffs to the east. One urchin/abalone diver was working in the cove when I arrived. This site was visited in February, and the regular sampling was completed then. I downloaded the temperature logger, then counted invertebrates in all plots except #438, one of the barnacle plots. I censused a few plots but there was not enough time for all of them. I measured abalone in a random search, trying to avoid areas I'd measured in February. In 30 minutes, I'd found 75 abalone, then I measured another 40. ($n=115$, average = 97.5, $\text{stddev} = 27.2$). A withered abalone was found and collected at the request of Mark Stevenson of Monterey Fish and Game. The crevice transect was checked. It held 12 black abalone and eight *Pisaster ochraceus*. Seven fresh black abalone shells were found (44,50,59,59,90,95,118 mm) and five fresh red abalone shells were found (20,23,30,53,75 mm).

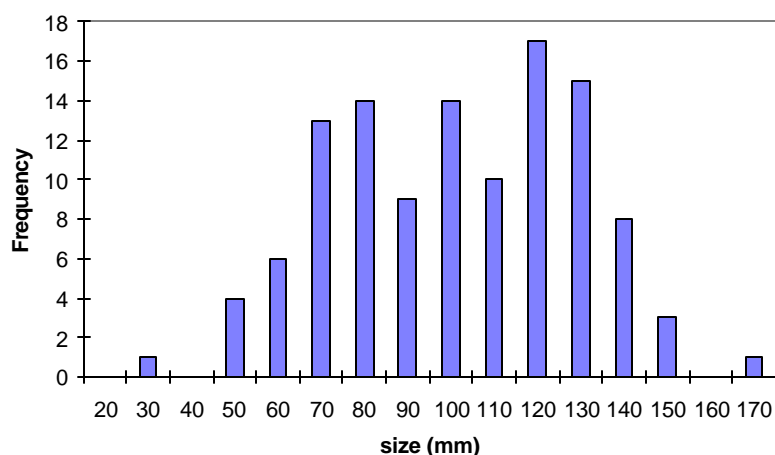


Figure 25. Black abalone size distribution at Harris Point, San Miguel Island

Table 11. Motile invertebrate counts from photoplots at Harris Point.

event 9704
Harris Point, SMI
4/2/97

zone	Plot number	<i>Tegula funebris</i>	<i>Littorina</i> spp.	<i>Acanthina</i> sp.	<i>Coenobita circumtexta</i>	<i>Nucella emarginata</i>	# Limpets	<i>Fissurella volcano</i>	<i>Lotia gigantea</i>	<i>Lepidochitona</i> sp.	<i>Nuttallina</i> sp.	Other species
Barnacle	436	0	0	0	1	6	16	0	20	1	9	
Barnacle	437	0	0	0	0	1	18	0	18	2	46	
Barnacle	438	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Barnacle	439	0	0	0	12	0	6	0	0	0	9	
Barnacle	440	0	43	0	0	0	14	0	0	0	0	
Endocladia	431	0	18	0	0	0	19	0	0	0	2	Pachygrapsus - 1
Endocladia	432	0	4	0	0	0	7	0	0	0	0	
Endocladia	433	0	0	0	0	0	14	0	0	0	0	
Endocladia	434	0	4	0	0	0	13	0	0	0	0	
Endocladia	435	0	16	0	0	0	13	0	0	0	0	
Rockweed	421	0	99	0	0	0	13	0	0	0	0	
Rockweed	422	0	45	0	0	0	16	0	0	0	0	
Rockweed	423	0	19	0	0	0	18	0	0	0	0	
Rockweed	424	0	10	0	0	0	13	0	0	0	0	
Rockweed	425	1	40	0	0	0	6	0	0	0	0	
Mussel	426	0	0	0	0	2	14	0	16	0	2	Pachygrapsus - 2
Mussel	427	0	3	0	1	2	29	0	0	0	0	
Mussel	428	0	7	0	0	0	47	0	0	0	0	Pachygrapsus - 1
Mussel	429	0	2	0	1	2	11	0	1	0	0	Pachygrapsus - 3 S.purpuratus - 7
Mussel	430	0	0	0	0	7	17	0	4	0	3	S. purpuratus - 1

nc = no count

Willow Canyon: April 7, clear strong NW wind, moderate surge, tide 0.0 ft @ 1633.

Approximately 80-100 elephant seals were on the beach at the mouth of Willow Canyon.

There were at least 30 harbor seals to the east at the site of our one-time surveys last year, so I worked to the west, searching for abalone in all the crevices and cracks, to the

cliffs about 250 m from the canyon mouth. Jagged rocks with all scales of crevices from tiny cracks to large surge channels characterize the intertidal. Pools form at all levels because of the splash and even some of the high pools had anemones and fish. Algae did not extend very high. *Corallina vancouveriensis* dominated the upper zone, with *Eisenia arborea*, *Laminaria setchellii*, and *Egregia menziesii* present below the mean low tide level. The small green alga, *Bryopsis* sp. was abundant in many of the pools. Shore crabs, *Pachygrapsus crassipes*, which were abundant everywhere this week, seemed particularly abundant along this coast. Several lined chitons, *Tonicella lineata* were found. One *Pisaster ochraceus* appeared to have wasting disease. Sea stars were counted in a 30 minute search, with 38 *P. ochraceus* and one *Asterina miniata* found. The first 30 minutes of searching turned up six black abalone, the next 30 minutes found nine, and only one was found after that. (n=16,, average=55.2mm, stddev=13.3)

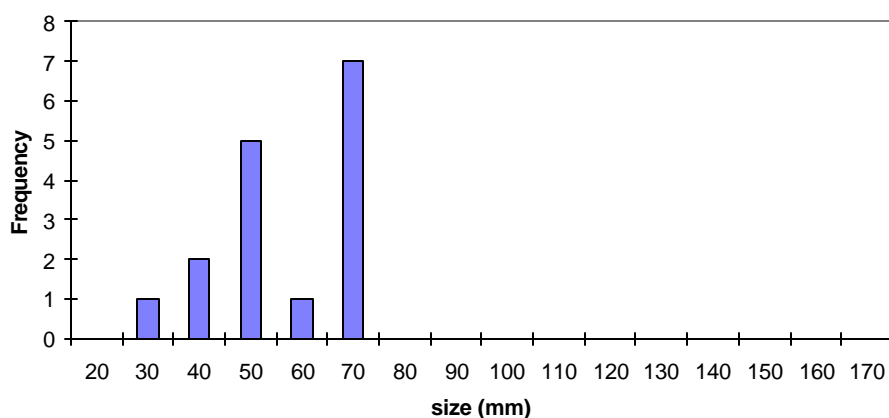


Figure 26. Black abalone size distribution at Willow Canyon, San Miguel Island

San Miguel Island November 12-17, 1997

(Database event #9711)

PURPOSE: To monitor rocky intertidal sites at San Miguel Island, download temperature loggers, and revisit Coastal Commission study one-time survey site at Leuzarder Point to collect black abalone size frequency data.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
Ian Williams, Island Ranger, Channel Islands National Park

PROCEDURE: We flew out on the Islander, along with Ian Williams, and Earl Whetsell who we dropped off at Santa Rosa. We visited all four permanent sites; Cuyler Harbor, Otter Harbor, Crook Point, and Harris Point. At each of the sites, we photographed and scored the photoplots, censused species within those plots, made corner marker repairs, measured and counted owl limpets and black abalone with permanent plots. Sea star counts were conducted, video documentation was shot and observations were recorded on shorebirds and pinnipeds. Optic Stowaway™ temperature loggers were downloaded at the two sites where they are located. At Leuzarder Point, we conducted a timed search and measurement for black abalone. On November 17th we flew over to Santa Cruz Island to help with the sheep roundup through the 19th.

Several days of occasionally heavy rain preceded our trip, but the majority of the air strip was dry. Ian spent most days near China Point helping the US Coast Guard attempt to remove an 85 ft longline fishing vessel (LADY CHRISTINE) from the beach there where it had run aground there on Nov. 11th. Attempts to pull the vessel off were unsuccessful. Most of the fuel was removed. Plans were made to remove the swordfish in the hold and pull the boat on the next high tide series.

RESULTS:

Nov. 12, 1997 Cuyler Harbor- Low tide 0.4ft @ 1413, Air temp 20°C, Water temp 18°C Wind 10 NW surge moderate. There were 26 Heermann's gulls, 5 black oystercatchers, and 2 ravens on the beach at Cuyler Harbor. Surfscoters were common offshore. The ravens were feeding on one of three dead California sealion pups. There was also a common dolphin carcass. Several measurements were taken of the dolphin (length 175 cm) but no photos. (Stranding form was sent to SBMNH). Decomposition was fairly advanced.

Difficulties were encountered getting across the middle rocks and the surge channel when crossing about noon and again at 1730 hrs. The photoplots were scored and photographed. Species census were conducted on all plots and a short video documentation was made of the site. Plot corners were repaired, several number tags had been illegible. About 90 minutes past low tide, Derek conducted a 20 minute search of the entire reef and found 14 sea stars, *Pisaster ochraceus*, and three black abalone, *Haliotis cracherodii*, (approximately 50, 100, 120 mm; the middle size individual was slightly withered).

Most species assemblages appeared to be healthy throughout the site. *Phragmatopoma californica* was abundant in the lower zones and crevices but not exceptional. *Balanus glandula* was the dominant barnacle and attained fairly high coverage in the upper plots. *Endocladia muricata* was healthy but the zone was narrow at the time. *Pelvetia fastigiata* had high cover in the plots and was the only rockweed present in any of the plots. California mussels, *Mytilus californianus*, were moderately dense in the zone with a mixture of age groups. Rockweed cover in the plots was up slightly and Endocladia cover down from April 1997.

Table 12. Photoplot summary - mean percent cover by zone at Cuyler Harbor, November 1997.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
Barnacle	59.6	38.6	1.0	0.0	0.0	0.0	0.8
Endocladia	54.2	10.0	24.2	4.6	1.6	2.8	2.6
Rockweed	6.4	0.2	0.2	89.4	0.2	2.4	1.2

Mussel	35.6	8.4	0.8	0.0	35.6	10.6	8.8
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November 13, 1997 Otter Harbor- low tide -0.8 ft @ 1458, air temp 19.5°C, water temp 17.5°C, Wind 8 NW, surge moderate, rain in AM. Pelicans and cormorants were actively feeding offshore most of the afternoon. Approximately 150 willets were present on the point to the east, three black turnstones, 2 black oystercatchers, and 18 harbor seals were present. There were 75 elephant seals on the beach to the east. Elephant seals were present in low numbers all along the north shore.

The photoplots were scored, photographed and censused. A short video documentation of the site was shot. All abalone and owl limpets plots were checked. Ian helped out recording data. We probably would not have finished before dusk and the incoming tide without his help. Six black abalone were present in plot 369 (one more than last spring) and none in any other plot. Eight abalone shells (6 fresh and 2 old) were collected. A large *Pisaster* was found feeding on a black abalone (approximately 120 mm long and apparently withered). Derek also found an octopus holding a black abalone shell with the partially eaten abalone. Owl limpet numbers seemed about average. The average size was slightly greater and number slightly lower than the spring sample. Five glue on plastic tags were attached to limpets in plot 369 to test their efficacy.

The algae all looked lush with both rockweeds (*Hesperophycus* and *Pelvetia*) being abundant. *Endocladia* seemed abundant, though cover was down from April 1997. Rockweed cover was higher than in April. *Balanus glandula* was common and dominant in the upper plots. *Bangia* was present in a couple of the upper plots. Blue-green algae were very common in the splash zone. *Rhodoglossum affine* was extremely common in the lower zones with *Gigartina canaliculata*. Both of these species were dominant in barnacle plot 374, which is covered by 97% algae. The same algae covered abalone plot 365. The green alga, *Cladophora columbiana* was very abundant in the lower zones also. California mussels were extensive and dense in patches. Large file limpets *Collisella limatula* were common. Small limpets and gastropods were present in average numbers throughout the site. Owl limpet abundance and size frequency showed little change from the April 1997 sample.

Table 13. Photoplot summary - mean percent cover by zone at Otter Harbor, November 1997.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
Barnacle	34.6	31.4	0.0	0.0	0.0	30.4	0.6	3.0
Endocladia	23.4	1.4	36.6	24.2	0.6	12.6	1.2	0.0
Rockweed	29.8	8.4	16.4	37.0	0.0	5.6	0.8	1.4
Mussel	18.6	0.8	0.4	0.0	64.6	12.0	3.0	0.6

Table 14. Owl limpet at Otter Harbor, San Miguel Island

Plot	Count	Mean Size	StDev
368	27	40.44	15.58
369	77	38.18	13.81
496	12	49.58	11.91

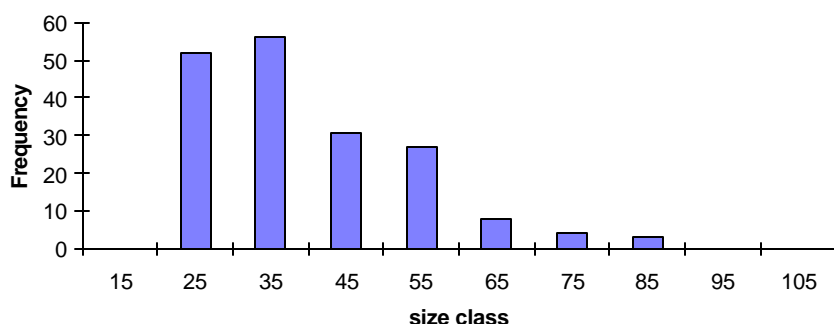


Figure 27. Owl limpet size distribution at Otter Harbor, San Miguel Island

Table 15. Black abalone at Otter Harbor, San Miguel Island.

Plot #	CountOfPlot	Mean Size	StDev	Min Size	Max Size
365	0				
366	0				
367	0				
368	0				
369	6	72.83	19.70	60	110

November 14, 1997 Crook Point- low tide -1.0 ft @ 1543 hrs, air temp 20°C, water temp 18°C, Wind 6-8 W, surge heavy. Light rain showers today. The outer reef was completely awash on all but the calmest sets at low tide. Approximately 40 cormorants

were present, higher on the reef than normal. The guano was much higher on the rocks than usual and the lower rocks were clean, indicating higher surf has been common this fall.

Access even to the inner reef was not possible until 1300 hrs. All 20 photoplots were photographed but only the 13 on the inner reef were scored and censused in the field. Video was shot from the inner reef only. No attempt was made to count abalone or limpets in the plots on the outer reef. The temperature logger was retrieved, but it failed repeatedly to transfer data to the shuttle. The unit was placed back in the housing in hopes that it reset and will record until it can be replaced.

Drift *Macrocystis*, *Eisenia*, and *Pterygophora* were draped over the reef, pulled up by the swell. Small mussels were abundant on the inner reef, especially in plots 382 and 383, but also in rockweed plot 387. Small sipunculids (peanut worms) were abundant among the mussels. Patches of leaf barnacles, *Pollicipes polymerus* were common. *Balanus glandula* was the dominant barnacle in plots but *Chthamalus fissus/dalli* was also numerous. The high pools, which are usually clear, were full of thin green filaments, probably *Chaetomorpha linum*. Copepods, *Tigriopus californicus*, were common in the pools. *Phragmatopoma californica* was common in small channels along bases of the reef. *Ulva* sp. was abundant on reef sides and on mussels of the inner reef.

Table 16. Photoplot summary - mean percent cover by zone at Crook Point, November 1997.

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
CP	Barnacle	70.6	24.4	1.6	0.0	0.4	00.0	3.0
CP	Endocladia	46.8	5.2	26.0	4.4	6.2	07.4	4.0
CP	Rockweed	37.6	0.8	16.6	14.2	17.8	10.2	2.8
CP	Mussel	10.4	0.6	0.0	0.0	79.2	06.0	3.8

November 15, 1997 Harris Point- low tide -1.0 ft @ 1628 hrs, air temp 19°C, water temp 18°C, wind 4-8 SE, surge heavy. Heavy rain this morning. Two black oystercatchers and one western gull on the rocks when we arrived. Very heavy surf, but it had died down from the previous day's conditions.

Photoplots were all scored, photographed, and censused. A short video was made, the sea star transect was counted and abalone were measured in the five plots. Six black abalone and three *Pisaster ochraceus* were present in the crevice transect. Purple sea urchins were abundant and red sea urchins were common in the crevice. A total of 56 black abalone were found in the plots ranging from 47-141 mm long. Four were withered to some degree. More may have been slightly shrunken but attached firmly to the rock. (Many appeared to have the shells right on the rock.) Algae, especially *Ulva*, was common on the cobble in the "nursery area" in front of plot 445. This seems unusual. There was not enough time to look for juveniles under rocks.

There were 13 fewer abalone in the plots than in February 1997.

Table 17. Photoplot summary - mean percent cover by zone at Harris Point, November 1997.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
Barnacle	52.8	20.0	2.4	0.0	5.4	14.8	4.6	0.2
Endocladia	49.2	3.0	32.0	10.4	1.8	2.0	1.2	0.0
Rockweed	51.8	0.2	9.0	35.8	0.0	1.4	1.8	0.0
Mussel	42.8	5.0	1.2	1.2	29.2	6.2	3.0	0.0

Table 18. Black abalone at Harris Point.

Plot	Count	Mean Size	StDev	Min Size	Max Size
441	18	90.83	22.65	47	128
442	13	112.69	15.78	82	140
443	9	105.78	12.08	90	122
444	2	98.00	7.07	93	103
445	14	89.71	21.46	64	141

November 16, 1997 Leuzarder Point- low tide -0.8 ft @ 1715 hrs, Wind 5 w, surge light. Elephant seals were on the beach east of the point and sea lions and harbor seals were watching us from the water. No shorebirds were present.

This site is on the western edge of Tyler Bight. In April 1996, 82 abalone were measured. The size frequency curves from 1996 and 1997 were very similar.

A total of 263 black abalone were measured in 80 minutes. Generally, only one of us was measuring while the other recorded. Numerous other abalone were observed but not measured. One 60 mm red abalone was found in a high crevice. One withered abalone was collected and two others were observed to be slightly shrunken.

Sea star counts were conducted and 225 *Pisaster ochraceus*, 24 *Asterina miniata* and one *Pycnopodia helianthoides* were found. All the stars appeared to be in good shape with no sign of wasting disease.

The site is amazingly rich in diversity. In addition to the abundance of black abalone and sea stars, we observed a variety of other snails, diverse algae, and abundant crabs. Abundant algae was present on the rocks all the way from the blue-greens in the splash zone to *Egregia* in the subtidal zone. Both *Pelvetia* and *Hesperophycus* were abundant. *Gigartina canaliculata* and *Rhodoglossum affine* were common. *Gracilaria* sp. was present in the sandy areas inshore. *Balanus* and *Chthamalus* were both abundant. The majority of mussels were small and present in patches on the outer reef. *Lottia gigantea* were abundant and large, one individual was measured at 100 mm. Sponges were common. Several nudibranchs were found including *Hopkinsia rosacea*. The crab, *Hemigrapsus nudus* was seen, *Pachygrapsus crassipes* was abundant.

Table 19. Black abalone at Leuzarder Point, San Miguel Island

Count	Mean Size	StDev	Min Size	Max Size
263	108.12	26.94	30	161

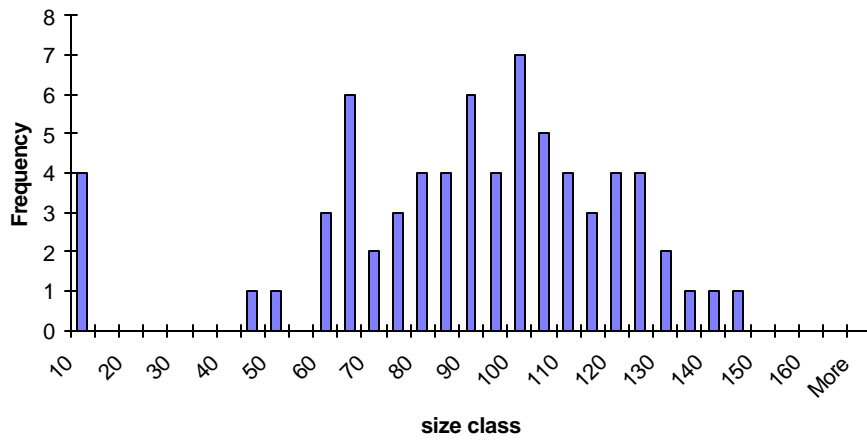


Figure 28. Black abalone size distribution at Harris Point and Otter Harbor combined, San Miguel Island

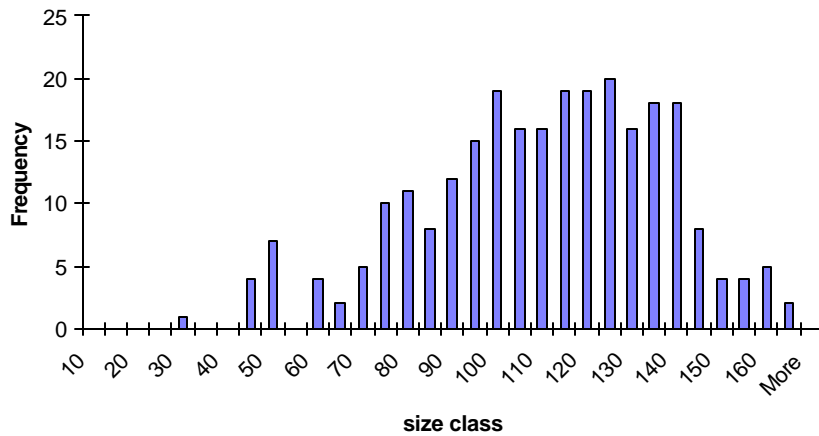


Figure 29. Black abalone size distribution at Leuzarder Point, San Miguel Island

Santa Rosa Island, February 19-21, 1997

Database event # 9702

Purpose: To monitor rocky intertidal sites at Fossil Reef and Northwest-Talcott at the west end of Santa Rosa Island. These sites were not sampled in fall 1996 because of bad weather. It has been over a year since these sites were last because of weather cancellations of previous trips. Physical measurements, photos, and bird counts were conducted at the coastal lagoons.

Personnel: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park

Procedure: Windy conditions caused the cancellation of the boat so we flew out to Santa Rosa on 2/19/97 at 1100 hrs. The road to pocket field and Fossil Reef was a little rough but passable. There were no major problems except the mouth of mud tank was washed out. Most of the vernal pools in Pocket Field had water, but they seem to be drying up fast. Conditions were clear and windy (30+ kts), the low tide was -0.4 ft at 1445. The photoplots were scored in the field, photographed and video taped with species census information on the video. The seastar transect was shortened to 15 m as the surf was washing over the outer reef. Abalone plots were inspected and some general size-frequency measurements were taken at the site and in the sea cave to the west.

On 2/20/97, elephant seals were counted on the Sandy Point beaches in the morning and monitoring was conducted at Northwest-Talcott in the afternoon. Photoplots were scored, photographed and videotaped with species census information voice-over on the video. Abalone plots and owl limpet plots were checked. Abalone transplant areas #1 and #2 were checked. Pelagic cormorants nesting on the bluffs kept us from visiting area #3.

We visited the lagoons and took physical measurements, photos, and counted birds on 2/21/97 before departing the island at 1245.

Results:

Fossil Reef, only abalone plot 628 had any black abalone with seven juveniles ranging from 30-77 mm in length. An additional 83 black abalone were measured around the area with a size range from 42-152 mm. Two black abalone were found with symptoms of Withering Syndrome. Twelve black abalone shells were measured and removed from the cobble beach ranging from 91-142 mm.

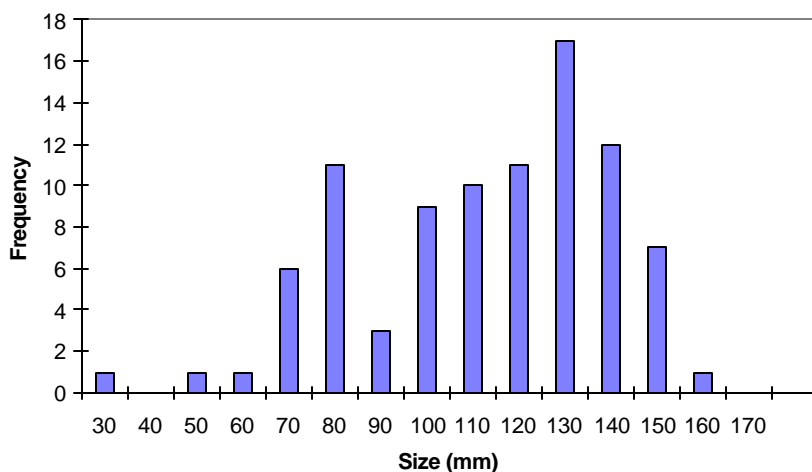


Figure 30. Black abalone size distribution at Fossil Reef, Santa Rosa Island

In the seastar transect (15x6 m), 37 *Pisaster ochraceus* and 6 black abalone were counted. Sandcastle worms, *Phragmatopoma californica*, algae and anemones, *Anthopleura elegantissima* dominated the lower mussel zone plots where the seastar transect crosses. Mussels were mostly found higher up on the reef near plots 622 and 623. There were few juvenile mussels in patches, but seastars are keeping the rest in check. Seastars were also observed feeding on sea urchin tests, and though present, the purple urchins seemed less abundant in pools and empty tests were common.

Table 20. Photoplot summary- mean percent cover by zone at Fossil Reef, February 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
FR	Barnacle	69	29	0	0	0	0	0.6	1.4
FR	Endocladia	35	20.2	3.2	38.8	0	1.2	2.2	0.2
FR	Rockweed	55	5.4	0.8	33.4	0	3.6	1.8	0
FR	Mussel	29.8	5.6	0.2	0	8	44.4	12	0

Pelvetia fastigiata plants looked a little tired and beat up. The surfgrass, *Phyllospadix scouleri* also appeared cropped and less extensive on the reef flat. *Neorhodomela larix* was common outside the sea cave, an unusual species on this side of the island. *N. larix* is generally found north of Point Conception and is well known at Northwest-Talcott. *Tegula funebris* were common throughout the site. Shore crabs, *Pachygrapsus crassipes*, were abundant. Birds observed in the area included 2 black oystercatchers, 2 western gulls, and 6 black turnstones. Some pelagic cormorants were roosting on rocks to the west. No marine mammals on the site, but seals were present on the beach to the west. Needed corner repairs in the mussel zone plots were not completed because of the incoming tide.

Northwest-Talcott, no black abalone were found in the plots. Two were observed at the site, though no measurements or general search were made. At transplant area #1, no abalone were found. At transplant area #2, we found five black abalone ranging from 120-156 mm. One of those was severely shrunken.

Large owl limpets were common on the outer reef at the monitoring site.

Table 21. Owl limpet numbers in monitoring plots at Northwest Talcott, February 1997.

Plot #	701	702	703	704	705
# limpets in 1 m radius	30	29	26	22	24

Owl limpet densities remained steady this site, though they are only about half the densities found at Johnson's Lee and Ford Point where average sizes are smaller.

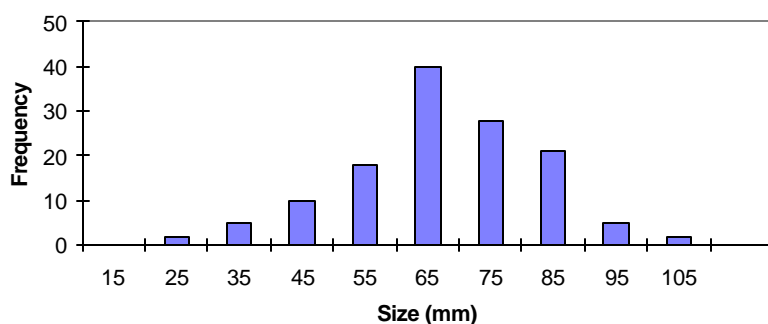


Figure 31. Owl limpet size distribution at Northwest Talcott, Santa Rosa Island

Pelvetia was lush, *Endocladia* looked good, and *Phyllospadix torreyi* dominates the reef flat. There were fewer shore crabs than at Fossil Reef. No seastars were seen on the site. Repairs were made to plot corners as needed, mostly to number tags no longer readable.

Table 22. Photoplot summary- mean percent cover by zone at Northwest Talcott, February 1997.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
NWT	Barnacle	37.2	56.8	1.6	1.8	0	0	2	0.6
NWT	Endocladia	34.8	9	35.4	16	0	4.4	0.4	0
NWT	Rockweed	30.8	0.2	4.6	63.2	0	0.8	0.4	0
NWT	Mussel	26.2	2.2	0	0	40.6	26.6	4.4	0

On arrival at the site, there were 20 California gulls, 4 western gulls, 4 royal terns, 1 black oystercatcher, and 1 double-crested cormorant. Two snowy egrets were observed foraging in the intertidal later.

On the morning of 2/20/97, Sandy Point area contained 451 elephant seals (178 pups and 119 adults on long beach, 104 pups and 39 adults (5 males) on crescent beach, and 7 pups 4 adults (1 male) on Sandy Point beach). There were several harbor seals including one pup on long beach. Pelagic cormorants were observed establishing nests on the point near crescent beach.

Coastal Lagoons: All three lagoons were full. Old Ranch creek had significant flow and the lagoon that had built up at the mouth was fresh water. Both Oat Point and Old Ranch House were a mix of rainwater and wave overwash. There were three pair of mallard ducks at Old Ranch Canyon and seven mallards, eight American coots at Old Ranch House lagoons. Twelve snowy plovers were between Oat Point and Old Ranch Creek and twelve more were between Old Ranch and Abalone Rocks. There were also 11 killdeer in the dune vegetation in front of the big lagoon.

Table 23. Physical measurements from coastal lagoons

station	Temp. (°C) @ surface	Salinity (ppt) @ surface	Temp. (°C) @ 10 cm	Salinity (ppt) @ 10 cm
Oat Point	10.9	18	10.9	18
Old Ranch	11.4	1	11.4	3
Old Ranch House #1	12	22	ND	ND
Old Ranch House #3	13	22	12	24

Santa Rosa Island, May 9-12, 1997

(Database event #9705)

PURPOSE: To install temperature loggers at three sites on Santa Rosa Island and assess black abalone populations at those sites. Conduct mark-release study on pismo clams.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Ian Taniguchi, Marine Biologist, California Dept. of Fish and Game

PROCEDURE: Optic Stowaway™ temperature loggers inside PVC housings were installed in the intertidal zone at about the +0.1 ft tide level (low mussel zone) at three sites. Four holes were drilled into rock to bolt the two brackets holding the housing. Procedures were the same as at the other islands.

Abalone surveys were conducted as general roving timed searches throughout the reef at a site. Rocks were turned where accessible. General species lists were conducted through roving searches. At Northwest-Talcott, photoplot species censuses and motile

invertebrate counts were conducted. Small limpets and littorine snails were counted in the upper left 25x25 cm. Other invertebrates were counted within a 50x50 cm area of the plot.

RESULTS: Early morning low tides all week, generally only left incoming tide workable. On May 9th, **East Point** was sampled and a temperature logger was installed vertically on the side of the reef approximately 1.5 m from photoplot 590 on the northwest corner of the site. One willet and one western gull were present on arrival. Ian searched for black abalone finding only one (107 mm). During a 30-minute search Dan counted 42 *Pisaster ochraceus*. A general species list was made the photopoints were photographed.

Visual observations and physical parameters were taken at each of the lagoons. The water at Old Ranch House Canyon Lagoon seemed well mixed with surface and 10 cm depth readings being the same. Stations 4 and 5 were 18.5°C and station 3 was 19°C. Fish fry were present at all sites. *Trichocorixa* and diving beetles were fairly ubiquitous. The aquatic plant, *Ruppia*, and shore crab, *Pachygrapsus*, were present at station 5. A family of mallard ducks was observed near station 4. There were nine chicks that appeared to be near fledging age and three adults. Additionally, there was one killdeer and one American coot. There is a minor amount of bull thistle in the area, but prickly lettuce, which is just coming up, seemed abundant compared to previous years.

Old Ranch Canyon Creek is developing a nice coastal lagoon again at the mouth after being washed out during storms two years ago. The water was well mixed at station 1 and 17.5°C. *Enteromorpha* was present and the salinity was likely very near that of the ocean water. One loon (yellow-billed?), 11 unidentified ducks, one female ruddy duck and six black brants were at the lagoon. A pair of peregrine falcons chased a shorebird over the creek.

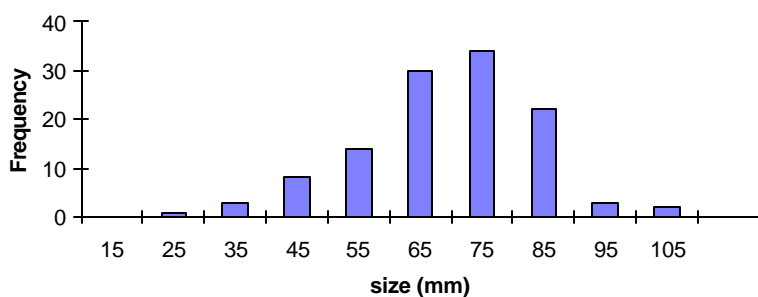
Snorkel sampling was conducted in **SE Anchorage** in the afternoon and 30 pismo clams were collected, marked with a single hacksaw cut on the upper right valve, then replaced. Only one of the clams was previously marked. It was identified as one of the subtidal transplants from Pismo Beach. Search time was 30 minutes each, with the wind stirring things up too much after that.

May 10th was spent with a broken fan belt on the truck and getting it back to the compound.

On May 11th, **Northwest-Talcott** was visited. A temperature logger was installed horizontally on the inner edge of the high reef near owl limpet plots 703 and 704. Only 18 abalone were found. Their sizes ranged from 87-153 mm. Owl limpets were measured in the 1-m radius plots. Photoplots were censused and motile invertebrates were counted in the photoplots. A general species list was also conducted. Algae were both diverse and abundant. By-the-wind-sailors, *Vellella vellella*, were washed up on shore, but were not particularly common.

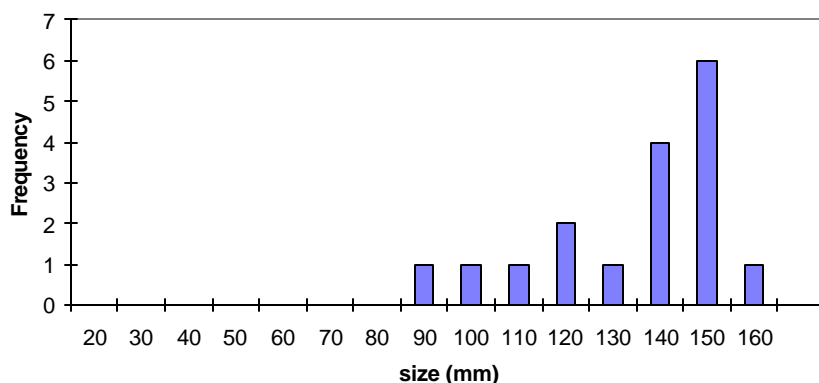
Table 24. Owl limpet numbers in monitoring plots at Northwest Talcott. May 1997.

Plot #	701	702	703	704	705
# Owl limpets/plot	24	30	22	22	20



Average size = 65.5 mm Std Dev = 14.6 n = 117

Figure 32. Owl limpet size distribution at Northwest Talcott, Santa Rosa Island



Average size = 129.4 mm Std Dev =19.2 n = 17

Figure 33. *Black abalone* size distribution at Northwest Talcott, Santa Rosa Island

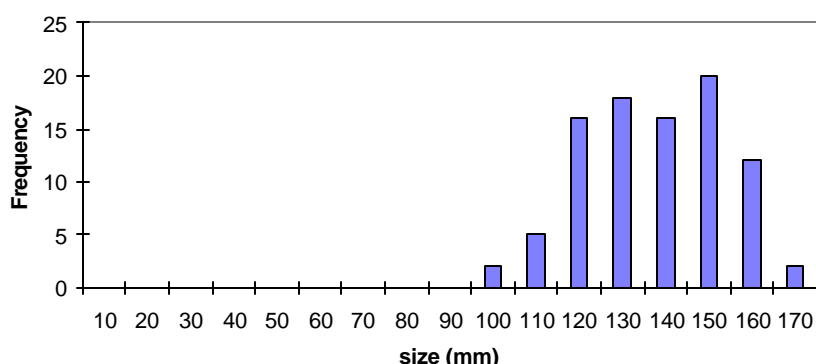
Table 25. Motile invertebrate counts from photoplots at Northwest Talcott.

Plot #	<i>Tegula funebris</i>	# <i>Littorina</i> spp.	# <i>Acanthina</i> sp.	# <i>Ocenebra circumtexta</i>	# <i>Nucella emarginata</i>	# Limpets	# <i>Fissurella volcano</i>	# <i>Lottia gigantea</i>	# <i>Lepidochitona</i> sp.	# <i>Nuttallina</i> sp.	Other species
560	0	220	0	0	0	1	0	0	0	0	0
561	0	112	0	0	0	1	0	0	0	0	0
562	0	143	11	0	0	25	0	0	0	0	0
563	0	74	7	0	0	27	0	0	0	0	0
564	0	170	0	0	0	72	0	0	0	0	0
555	0	0	20	0	0	29	0	0	1	0	0
556	1	1	12	2	1	21	0	0	0	0	0
557	3	0	0	1	0	5	0	0	2	0	0
558	0	1	3	4	0	17	0	0	0	2	0
559	0	0	0	0	0	5	0	2	1	0	0
565	0	9	0	0	0	0	0	0	5	0	0
566	7	2	2	0	0	0	0	0	0	0	1T.gallina
567	2	20	0	0	0	6	0	0	8	0	0
568	0	1	1	0	0	6	0	0	0	1	0
569	1	0	2	0	0	0	0	2	0	0	0
550	0	0	0	3	3	29	2	8	3	15	0
551	0	0	0	3	2	24	0	1	0	26	0
552	0	1	0	1	2	14	0	7	0	6	0
553	0	0	0	0	1	13	1	5	0	3	0
554	0	0	0	1	1	6	2	2	0	38	0

Four harbor seals, four black oystercatchers, and 2 western gulls were present at the site. A pair of peregrine falcons was observed taking a lark in Pocket Field. A pair (same birds?) hovered over us chipping when we were on the bluff above the site. There were at least a dozen brown pelicans roosting on the point by Jaw Gulch and there is a large

Brandt's cormorant colony on the bluff to the east. *Castilleja mollis* was in bloom on the bluff and noticeable it all the way to the beach in the cove.

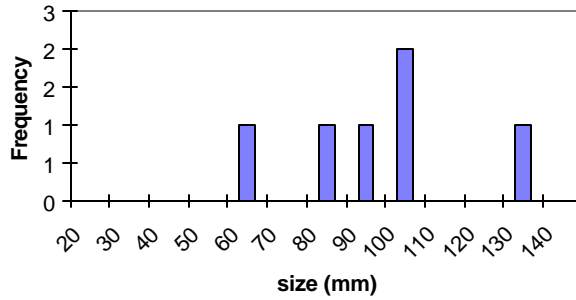
Pismo clams were sampled at **SE Anchorage** again. Actual search time was approximately 75 minutes each. A total of 61 pismo clams were marked and returned. There were eight with previous marks, one was pre-1989, one from 1994, one from 1996, four subtidal transplants, and one with a single cut in the lower right valve which may have been a mistake (from 1994?) as that code is for the year 2000. A total of 12 shells were found during the two days, none were marked.



Average clam size = 133.5 mm, Std Dev = 16.1, n =91

Figure 34. *Tivela stultorum* size distribution at Southeast Anchorage, Santa Rosa Island

On May 12th, **Johnson's Lee** site was visited. A temperature logger was installed horizontally across from abalone plot 518, just above the tidepool. We had some problems with the bolts, but epoxied them down well. The limpet plots were photographed and a general species list was conducted. Ian measured abalone and found nine, but was only able to measure six. Corner bolts were placed in mussel plots 510 (upper left and lower right) and 511 (upper right), taking advantage of having the drill. Both of these plots frequently loose the epoxy corners or get buried by *Phragmatopoma californica*.



Black abalone average size = 86.8 Std Dev = 23.9 n = 6

Figure 35. Black abalone size distribution at Johnson's Lee, Santa Rosa Island

We briefly searched for grunion eggs by trenching at the beach at Water Canyon in the afternoon but found none.

The Fish and Game vessel MAKO arrive around 5 PM and we loaded our gear on for the abalone cruise at San Miguel Island.

Santa Rosa Island, January 8-11, 1998
(Database event #9801)

PURPOSE: To monitor rocky intertidal long-term monitoring sites at Santa Rosa Island and download temperature loggers.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
Dan Martin, Research Assistant, UC Santa Barbara

PROCEDURE: We flew out late on Jan. 8 arriving about 1600 hrs on the island. Over 1.5 inches of rain fell the next day. We ventured out to the rocks in Becher's Bay and did a species list of the intertidal there.

On January 10th we hiked to East Point (about a 2 1/2 hour hike) counting birds and checking salinity at the Old Ranch House Canyon Lagoon along the way. At East Point, photoplots were field scored, photographed, and censused. Select gastropods were counted in the plots. Plot corner repairs were made. A thirty minute search of the reef was made for abalone and sea stars. The temperature logger was successfully downloaded.

It did not look as though the roads would dry enough to drive over Black Mountain and more rain was forecast, so we took advantage of an empty plane going in on January 11.

RESULTS:

Numerous waterfalls were flowing onto the beach from the bluff above Becher's Bay on 1/9. We investigated the rocks south of the pier and found an interesting assortment of algae and animals. Rockweed, *Pelvetia fastigiata*, was abundant on the rocks there. Sand castle worms, *Phragmatopoma californica*, were abundant but all the tubes were noticeably small. Two uncommon algae were present here: *Cumagloia andersonii* and *Neorhodomela larix*. The barnacle *Chthamalus fissus/dalli* had recently settled throughout the site and were present even on shells of some of the small limpets. Black turban snails, *Tegula funebris*, was common as were hermit crabs in olive shells. There was a freshwater lens on the tidepools with salinities measured at 2-8 ppt at the surface and 20-27 ppt at a depth of 5 cm. The ocean salinity next to shore was only 31.9 ppt. Three willets and one black oystercatcher were present in the area.

East Point: Low tide on 1/10 was -0.9 ft at 1452 hrs. We worked the site from 1230-1530. Winds were light and the surge was moderate. Intermittent showers fell throughout the day. Water temperature was 16°C. The temperature logger worked but the housing was full of sand when it was opened.

Numerous birds were present when we arrived including 15 brown pelicans, approximately 100 cormorants (mostly double-crested), approximately 150 gulls (mostly western), two black oystercatchers, and six black turnstones. There were two sandpipers (least or western) at the rain pools on the road. A great blue heron was seen just south of the lagoon.

In the 30 minute search, 21 seastars, *Pisaster ochraceus*, and 1 black abalone, *Haliotis cracherodii* were counted. The abalone was 91 mm. Sea hares, *Aplysia californica*, were common in the pool on the north side of the site. The coralline algae, *Lithothrix aspergillis* was also common in the pool. Both species of surfgrass, *Phyllospadix scouleri* and *P. torreyii*, were present.

Table 26. Photoplot summary-mean percent cover by zone at East Point.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
Barnacle	55.4	31.4	3.6	0.0	0.0	3.6	6.0	0.0
Endocladia	32.4	2.4	55.8	6.4	0.0	1.2	1.8	0.0
Rockweed	5.0	0.0	0.2	88.8	0.0	6.0	0.0	0.0
Mussel	1.4	0.0	0.0	0.0	73.4	22.8	2.4	0.0

At Old Ranch House Canyon Lagoon there were 27 willets, 1 eared grebe, approximately 40 widgeon, and 40 mixed coots and green-winged teal. The peregrine falcon was seen several times near the mouth of Old Ranch Canyon. We saw a double crested cormorant carcass with the breast meat torn out near East Point.

Old Ranch House Canyon Lagoon was full and the mouth was closed off. It appeared to be well mixed with salinities ranging from 20 ppt at the surface to 22 ppt at 10 cm. The lagoon temperature was 14.5°C and did not vary with depth. Oat Point lagoon was full and Old Ranch Canyon Creek was flowing well with a small lagoon at the mouth. The seawater was muddy for some distance around the mouth of the creek. We did not visit either of these lagoons.

Santa Rosa Island, January 23-27, 1998
(Database event #9802)

PURPOSE: To monitor rocky intertidal long-term monitoring sites at Santa Rosa Island and download temperature loggers.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
David Kushner, Marine Biologist, Channel Islands National Park

PROCEDURE: On 23 January, we arrived on Santa Rosa Island at 0930 after an early departure on the ISLAND RANGER. After unloading our gear we drove to Johnson's Lee to conduct the monitoring there. Photoplots were scored, photographed, and censused for species. The temperature logger was downloaded, abalone and seastars were counted in a 30-minute search, and owl limpets were measured inside plots. Corner repairs were made to photoplots.

On 24 January, we drove to Northwest-Talcott finding the roads in fair condition. Photoplots were scored, photographed, and censused for species. The temperature logger was downloaded, abalone and seastars were counted in a 30-minute search, and owl limpets were measured inside plots. Corner repairs were made to photoplots.

We helped with the concrete slab pouring for the new duplex until 1015 then drove to Ford Point on 25 January. Photoplots were scored, photographed, and censused for species. Abalone and seastars were counted in a 30-minute search, and owl limpets were measured inside plots. Corner repairs were made to photoplots. Polyethylene glue-on tags (Hallprint tags) were attached to 15 owl limpets with cyanoacrylate glue as a trial tagging.

On 26 January, we drove out to Fossil Reef. We counted elephant seals along the south side of Sandy Point before proceeding with the site monitoring. Photoplots were scored, photographed, and censused for species. A shortened transect (15 m) was checked for seastars. Abalone plots were checked and abalone were measured over a 30 minute search. Six withered abalone were collected to be sent to Dr. George Gardner at EPA in Rhode Island for histological analysis.

RESULTS: Numerous gray whales were observed along the north side of Santa Cruz Island on the ride out to Santa Rosa Is. Black-vented shearwaters were common in the channel, surf scoters were common in Becher's Bay.

Johnson's Lee: Low tide +0.4 ft @ 1323, air 19°C, water 16.5°C, wind and surge light. We observed one western gull, four black turnstones, and three black-bellied plovers in the area when we arrived on the site at 1130 hrs. The temperature logger downloaded successfully. No black abalone were found in the plots and only two were found at the site. One of those appeared unhealthy and could be pulled off the rock by hand though it not appreciably withered. The other abalone was not "robust" in appearance.

Pisaster ochraceus were abundant, 159 were counted during the 30-minute search. There were six *P. ochraceus* within the area of plot 517-518. Most of the seastars were fairly small, only 10-15 cm in diameter. The tide was not low enough to permit us to do

the seastar transect. We had hoped to comeback after working at Ford Point but the swell was too large that day.

Phragmatopoma is still abundant on the lower shelf and their sand tubes obscured even the bolts in plot 510. This mussel plot is completely covered by *Phragmatopoma*, anemones, and turf algae (mostly *Gigartina canaliculata*). Mussel plots 511, 513, and 514 are also primarily *Phragmatopoma* or turf algae. We could not find plot 514. A photo was taken of the approximate location but we did not score it. Mussel cover in plot 512 was 54% and this was representative of the cover on the higher shelf where there are few seastars. *Balanus glandula* cover was fairly high in all barnacle plots except 504. *Endocladia* cover was fairly thin in all plots.

Table 27. Photoplot summary-mean percent cover by zone at Johnson's Lee.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
Barnacle	61.2	36.2	0.2	0.0	0.2	2.2	0.0	0.0
Endocladia	76.4	1.8	10.2	0.0	9.8	1.4	0.4	0.0
Mussel	10.6	0.2	0.0	0.0	11.2	25.2	32.8	0.0

Owl limpet numbers at this site continue to decline in the monitoring plots. Within the 0.5 m radius, totals are less than 25% of the 1988 total. The 1 meter radius total is slightly higher at 44% of the 1994 total, the first year the larger diameter was counted.

Table 28. Owl limpet counts at Johnson's Lee.

Plot #	595	596	597	598	599	Grand Total
count	5	13	5	7	6	36

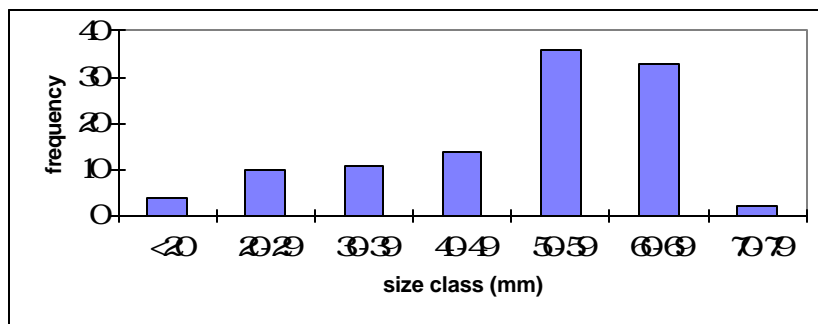


Figure 36. Owl limpet size distribution at Johnson's Lee. N=110.

Northwest-Talcott: Low tide -0.1 @ 1358, Air 14°C, water ~15°C (thermometer broke), wind 15kts, surge moderate. Temperature logger was successfully downloaded. When we arrived at 1130 hrs, there were 11 black oystercatchers and 2 western gulls. On the beach nearby, there were three elephant seals, and one in the water. We looked in the cove to the east while waiting for the tide to drop and found two great blue herons and five snowy egrets roosting on the side of the bluff. There were 4-5 large nests from last year that we could see in the vicinity of where the herons were roosting. A number of brown

pelicans were roosting on the point, they are showing red throat pouches. Pelagic cormorants had white patches but we did not see any nests yet.

Two black abalone were found in a 30 minute search, one was slightly withered. No abalone were present in plots. No seastars were found. Owl limpet numbers have not changed since May 1997.

Table 29. Owl limpet counts at Northwest-Talcott.

Plot #	701	702	703	704	705	Grand Total
count	26	29	25	20	19	119

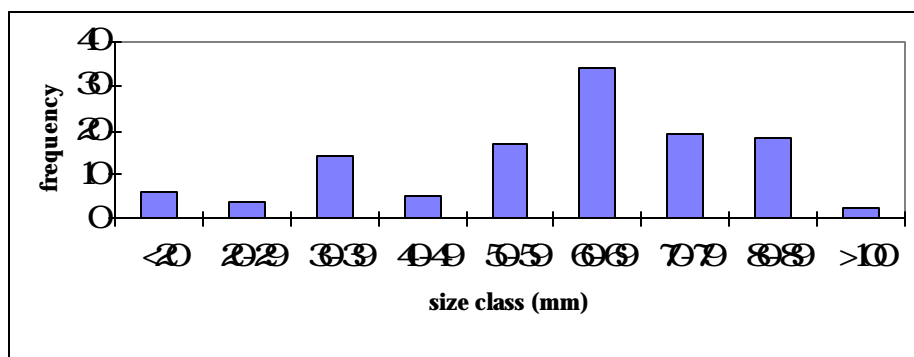


Figure 37. Owl limpet size distribution at Northwest-Talcott. N=119.

Black turban snails, *Tegula funebris*, were very common. A few *Tegula gallina* were found here also. The alga, *Neorhodomela larix* was common inshore. Several giant keyhole limpets were found in high tide pools apparently washed in by the surf. Various fish were found including pricklebacks, gunnels, and a blind goby.

Barnacle cover was fairly high, but plot 563 is partially dominated by *Pelvetia fastigiata*. *P. fastigiata* was present in nearly all Endocladia plots and covered 75% of plot 557. Though *P. fastigiata* was doing well at the site, two rockweed plots (568,569) had sparse cover, which is typical for these two plots. Coralline algae were abundant in most of the mussel plots. A layer of rock apparently broke off in the upper right corner of plot 553. A dense layer of brown algae, *Endarachne binghamae* and *Scytosiphon lomentaria*, covers the new rock. New epoxy was applied to mark the corner.

Table 30. Photoplot summary-mean percent cover by zone at Northwest-Talcott.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
Barnacle	47.0	38.8	0.2	9.8	0.0	3.2	0.0	1.0
Endocladia	46.4	0.4	19.4	20.0	0.0	13.8	0.0	0.0
Rockweed	32.0	0.2	2.8	62.2	0.0	2.8	0.0	0.0
Mussel	23.6	0.6	0.0	0.0	37.4	37.2	1.2	0.0

At some point, new corner markers had been placed at plot 566 when the originals could not be found, but all four original corners were found this time. The new plot was about

45° off. The new (wrong) corner markers were removed. The original plot was scored but the photo was taken of the wrong orientation and The plot was not re-photographed after the error was discovered.

Ford Point: Low tide -0.6 ft @ 1432, air 25°C, water 16.5°C, clear and calm with heavy surge. A red breasted merganser and a surf scoter were in the surf just off the site. Three black turnstones, one whimbrel, one song sparrow and one least sandpiper were observed at the site.

In a 30 minute search, David found 12 black abalone and 81 *Pisaster ochraceus*. Abalone sizes ranged from 30 -137 mm. None of the abalone were in plots. Unlike Johnson's Lee, the owl limpet totals have not changed since 1988.

Table 31. Owl limpet counts at Ford Point.

Plot #	600	601	602	603	604	Grand Total
count	5	9	12	9	18	53

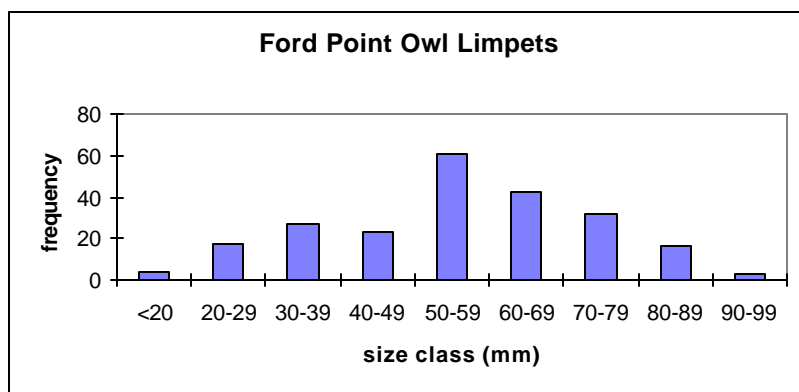


Figure 38. Owl limpet size distribution at Ford Point. N=225.

15 owl limpets were tagged with Hallprint glue-on tags (Table 31). The tags are about 2 mm long and blue, yellow, and red tags were used.

Table 32. Owl limpet tag data.

Plot	Tag #	color	size (mm)	living on shell
602	K281	yellow	48.0	1 limpet sp.
602	K282	yellow	90.0	3 lg. <i>C. scabra</i> , 2 sm. <i>C. scabra</i> , 1 limpet sp.
602	K283	yellow	85.7	few barnacles
602	K284	yellow	97.2	algal film
602	K285	yellow	76.3	algal film
602	D026	blue	84.6	3 limpets sp.
602	D022	blue	72.2	1 <i>C. scabra</i>
602	M135	red	50.3	2 <i>C. scabra</i> , barnacles
603	D023	blue	63.1	barnacles
603	D024	blue	72.2	1 <i>C. scabra</i> , algal film
603	D025	blue	79.8	1 lg. <i>C. scabra</i>

603	M136	red	46.7	green algae
603	M137	red	61.5	1 <i>C. scabra</i>
603	M138	red	55.2	green algae
603	M139	red	46.1	clean

The mussel plots all had high mussel cover except plot 530, which had seven large owl limpets. *Endocladia* appeared to be a little denser than at Johnson's Lee. Gastropods were fairly uncommon except for small *Littorina* in the barnacle plots

Table 33. Photoplot summary-mean percent cover by zone at Ford Point.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
Barnacle	67.6	31.4	0.2	0.0	0.0	0.8	0.0	0.0
Endocladia	49.2	0.6	23.0	0.0	3.8	23.4	0.0	0.0
Mussel	31.4	0.0	0.0	0.0	54.4	14.0	0.2	0.0

Fossil Reef: low tide -1.0 ft @ 1507, air 17°C, water 16°C, wind light, surge heavy. Conditions were thick fog and cold in the afternoon. At the site at noon there were 4 black oystercatchers, 40-50 western gulls, 20 cormorants, 3 terns, and 4 black turnstones. There were 10 harbor seals on the adjacent reef. We counted elephant seals from about 1030-1200 and found a total of 496 females, 29 adult males, 7 immature males and 367 pups between Fossil Reef and Sandy Point. Of those, 192 females, 10 males and 125 pups were on the crescent beach. There were at least an additional 12 adult seals on the NW facing beach of Sandy Point.

David measured 41 black abalone in about 30 minutes in the boulder area to the west side of the main reef. Seven of those were withered. Pycnogonids were found on some of the abalone. There were no abalone in any of the plots. We searched carefully for juveniles in plot 628 but could not find any. Four abalone shells were found on the cobble beach (old-103, 80, 85 mm, fresh 115 mm). I noted that surfgrass has invaded into abalone plots 625, 626, and 627. Most of the central reef flat in that surfgrass or *Phragmatopoma* covers area.

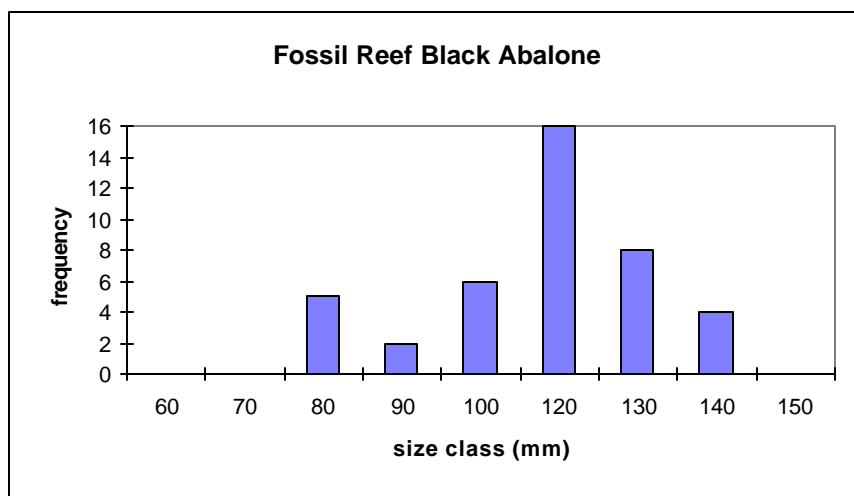


Figure 39. Black abalone size frequency at Fossil Reef. N=41.

Black turban snails were extremely abundant throughout the site. There is abundant *Phragmatopoma*, especially on the protected edge of the outer reef. Turf algae, mostly *Gigartina canaliculata*, is well established on top of the worm tubes. I checked the rock slopes east of the site and found the owl limpet densities to be abundant.

I found 20 *Pisaster ochraceus* in the 15x6 m transect. The full 30 m transect could not be completed because of the surf.

Endocladia cover in the plots was fairly sparse and three of the *Endocladia* plots had more rockweed than *Endocladia*. *Pelvetia fastigiata* was fairly abundant but was somewhat beat up in some areas with just the short thick bases present. Very few mussels were present in any of the plots. Coralline algae and *Phragmatopoma* dominate the mussel plots. *Phragmatopoma* cover may be higher than the actual numbers because of fouling by algae.

Table 34. Photoplot summary-mean percent cover by zone at Fossil Reef.

Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimal	Tar
Barnacle	66.6	30.6	0.0	0.0	0.0	1.4	0.0	0.4
Endocladia	32.8	17.8	5.6	40.2	0.0	3.6	0.0	0.0
Rockweed	52.8	9.8	1.2	31.2	0.4	4.0	0.6	0.0
Mussel	11.8	8.2	0.2	0.0	2.4	55.2	22.2	0.0

Anacapa Island, March 4-6, 1997

(Database event #9703)

PURPOSE: To monitor rocky intertidal sites at Anacapa, download temperature loggers, and count motile invertebrates in plots to gather baseline information and test method as possible protocol addition to monitoring.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park
Carol Thornber, graduate student, UCSB (6 March)
Annette Sanders, VIP (6 March)

PROCEDURE: Day trips were made to the islands over three days. On 4 March, the SEA RANGER dropped us off to skiff ashore then went on to SBI. The low tide was -0.2 ft at 1241 hrs and weather and sea conditions were good. Access to Cat Rock was prevented by the presence of harbor seals with pups were on the beach and at the Cat Rock site so we worked at South Frenchy's. Derek scored plots, conducted a 30-minute search/measure of owl limpets, and made plot corner repairs. Dan photographed the plots, did species census in all plots, and counted snails, limpets and chitons in 17 plots.

The ISLAND RANGER dropped us off on both 3/5 and 3/6 then went on to SRI and SCI. Low tide was -0.6 ft @ 1324 on 3/5 and conditions were calm. We landed at Cat Rock, avoiding harbor seals. Derek scored all 36 plots and conducted a 30-minute size frequency of owl limpets, Dan photographed plots, conducted a 30-minute abalone search, species census in all plots, and counted snails and limpets in 17 plots.

On 3/6, the low tide was -0.9 ft @ 1404 hrs, weather conditions were rougher and more swell was hitting Middle Island. We landed at Frenchy's and downloaded the temperature logger, then went to Middle Anacapa (West). A brief video documentation was shot at both South Frenchy's and Middle. Carol downloaded the temperature logger Derek photographed the plots and I counted snails, limpets, and chitons in 19 plots. Because of

the swell and waiting boat, no landing was attempted at the east site or at Harbor Seal Arch to look for abalone.

RESULTS: The barnacle, Endocladia, and rockweed zones were all doing well at each site. The mussel plots also had good coverage. The number of small littorine snails was somewhat astounding and other species were more abundant than I expected. The method of counting inside the entire plot is difficult and time consuming, though the plots themselves seem to work as far as coverage of habitat. For littorines, I quickly shifted to counting only in the upper left quarter. We might consider a 50 x 50 cm quadrat divided in quarters for future counts.

Island Packers landed groups each day at Frenchy's.

South Frenchy's Cove, no abalone were found at the site. During a 30-minute search, 97 owl limpets were measured. No seastars were found. Juvenile sea hares were present in the tidepool. *Jania* sp., a southern alga, is very common especially in the large tidepool on the west side of the site. *Lithothrix aspergillum*, another coralline alga, was common in some of the surge channels.

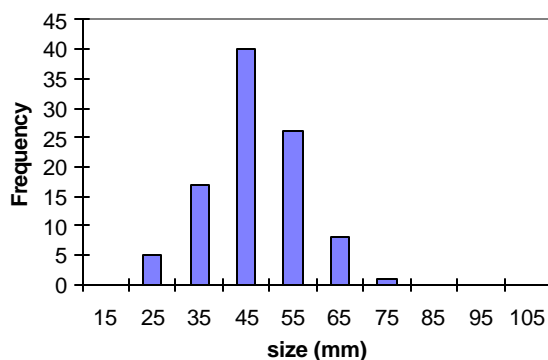


Figure 40. Owl limpet size distribution at South Frenchy's Cove, Anacapa Island

Table 35. Photoplot summary - mean percent cover by zone at South Frenchy's Cove.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Tar
SFC	Barnacle	42.6	44.0	10.6	0.0	0.0	00.2	1.6	1.0
SFC	Endocladia	22.0	2.8	62.8	7.4	0.0	03.8	1.2	0.0

SFC	Mussel	10.8	0.8	0.2	0.0	72.4	15.4	0.4	0.0
SFC	Rockweed	24.8	3.8	2.4	59.6	0.0	08.8	0.6	0.0

Cat Rock, three black abalone were found, (49, 80, 128 mm) and four moderate to fresh shells were found (60, 60, 64,74 mm). The largest abalone was inside plot 300.

110 owl limpets were measured during a 30-minute search.

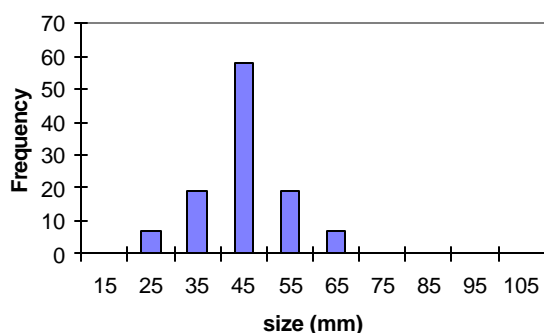


Figure 41. Owl limpet size distribution at Cat Rock, Anacapa Island

Table 36. Photoplot summary - mean percent cover by zone at Cat Rock.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussel	MiscAlga	MiscAnimal	Tar	Other
CR	Barnacle	25.0	33.2	8.2	28.8	0.0	02.9	1.6	0.2	0.1
CR	Endocladia	22.9	11.0	41.8	2.6	1.2	17.4	3.1	0.0	0.0
CR	Mussel	21.9	21.0	1.9	0.0	33.1	17.7	4.7	0.0	0.0
CR	Rockweed	15.9	11.9	13.8	50.2	0.1	07.4	0.7	0.0	0.0

On the site there were four western gulls, one black oystercatcher, and nine harbor seals watching us from the water.

Middle Anacapa West, photoplots were scored from slides.

Table 37. Photoplot summary - mean percent cover by zone at Middle Anacapa West.

Site	Zone	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
MW	Barnacle	53.8	15.6	11.4	0.0	0.0	19.2	0.0
MW	Endocladia	33.2	4.6	22.4	4.8	3.6	31.4	0.0
MW	Rockweed	25.4	4.4	1.8	45.4	4.4	17.8	1.0
MW	Mussel	20.2	2.0	2.8	0.0	53.6	20.8	0.6

Table 38. Motile invertebrate numbers from photoplots, mean number per 50 x 75 cm plot by zone (*Littorina* numbers were extrapolated from 25 x 37.5 cm area in Barnacle Zone only), South Frenchy's Cove, Anacapa. 4 Mar 1997

Plot #	# <i>Littorina</i> spp.	# <i>Acanthina</i> sp.	# <i>Ocenebra</i> <i>circumtexta</i>	# <i>Nucella</i> <i>emarginata</i>	# Limpet s	# <i>Fissurella</i> <i>volcano</i>	# <i>Lottia</i> <i>gigantea</i>	# <i>Lepido-</i> <i>chitona</i> sp.	# <i>Nuttallina</i> sp.	# <i>Tegula</i> <i>funnebralis</i>
249	320	0	0	0	ND	0	0	0	0	0
250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
251	280	0	0	0	ND	0	0	0	0	0
252	190	0	0	0	ND	0	0	0	0	0
253	350	ND	ND	ND	ND	ND	ND	ND	ND	
Barnacle zone avg.	285	0	0	0	ND	0	0	0	0	0
254	ND	ND	ND	ND	7	ND	ND	ND	ND	
255	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
256	73	1	0	0	3	0	0	0	0	0
257	71	0	0	0	3	0	0	0	0	0
258	11	0	0	0	3	0	0	0	0	0
Endocladia zone avg.	52	0	0	0	4	0	0	0	0	0
259	23	1	ND	ND	8	ND	ND	1	ND	0
260	41	1	0	0	12	1	0	2	1	0
261	10	4	0	1	14	0	0	1	1	2
262	51	0	0	0	24	0	2	3	3	0
263	0	1	0	1	2	0	0	0	1	0
Rockweed zone avg.	25	1	0	1	12	0	1	1	2	0
201	0	1	0	3	ND	0	0	0	12	0
202	0	1	1	4	ND	0	ND	0	1	0
264	0	3	3	7	ND	0	0	0	ND	0
265	0	0	1	11	ND	0	2	0	2	0
266	0	0	0	5	ND	0	ND	0	4	0
Mussel zone avg.	0	1	1	6	ND	0	1	0	5	0

Table 39. Motile invertebrate numbers from photoplots, mean number per 50 x 75 cm plot by zone (*Littorina* numbers were extrapolated from 25 x 37.5 cm area). Invertebrate counts, Cat Rock. 5 Mar 1997

Plot number	# <i>Littorina</i> spp.	# <i>Acanthina</i> sp.	# <i>Ocenebra circumtexta</i>	# <i>Nucella emarginata</i>	# Limpets	# <i>Fissurella volcano</i>	# <i>Lottia gigantea</i>	# <i>Lepidochitona</i> sp.	# <i>Nuttallina</i> sp.	<i>Tegula funebris</i>
33	200	1	0	0	15	0	0	0	0	0
37	34	0	0	0	12	0	0	0	0	1
135	130	4	0	0	10	0	0	0	0	0
31	300	0	0	0	4	0	0	0	0	0
35	340	0	0	0	5	0	0	0	0	0
38	90	0	0	0	16	0	0	2	0	0
32	200	0	0	0	4	0	0	0	0	0
36	24	1	0	0	16	0	0	1	0	0
39	300	0	0	0	1	0	0	0	0	0
Barnacle zone avg.	180	2	0	0	9	0	0	1	0	1
212	0	0	0	0	0	0	0	0	0	0
14	4	0	0	0	22	0	0	2	16	0
51	52	0	0	0	0	4	1	2	4	0
54	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	45	14	0	0	5	0
53	0	0	0	0	0	0	0	0	0	0
19	31	0	0	0	8	0	0	2	0	0
Endocladia zone avg.	29	0	0	0	25	9	3	2	8	0
2	0	0	0	0	0	0	0	0	0	0
55	75	0	0	0	0	0	0	0	0	0
9	6	4	0	0	6	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	24	2	1	0	9	0	0	1	0	0
4	0	1	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
10	6	3	0	0	7	0	0	2	0	0
Rockweed zone avg.	28	3	1	0	7	0	0	2	0	0

Table 40. Motile invertebrate numbers from photoplots, mean number per 50 x 75 cm plot by zone (*Littorina* numbers were extrapolated from 25 x 37.5 cm area).

Invertebrate counts, Middle Anacapa West. 6 Mar 1997

Plot number	# Littorina spp.	# Acanthina sp.	# Ocenebra circumtexta	# Nucella emarginata	# Limpets	# Fissurella volcano	# Lottia gigantea	# Lepido-chitona sp.	# Nuttallina sp.	Mopalia sp.
447	131	0	0	0	6	0	0	1	0	0
448	2	0	3	0	14	0	0	2	10	0
449	18	1	0	0	17	0	0	0	0	0
450	18	3	0	0	4	0	0	0	0	0
451	45	0	0	0	48	0	0	3	1	0
Barnacle zone avg.	43	1	1	0	18	0	0	1	2	0
457	1	0	1	1	44	0	1	0	0	0
458	0	1	0	0	41	0	4	0	0	0
459	11	0	0	1	25	0	0	0	2	1
460	26	1	0	1	6	0	0	3	1	0
461	46	1	0	0	3	0	0	0	0	0
Endocladia zone avg.	17	1	0	1	24	0	1	1	1	0
452	34	0	0	0	6	0	0	1	1	0
453										0
454	0	5	0	1	67	0	0	1	4	0
455	0	0	0	0	13	0	0	2	1	0
456	0	0	4	3	13	2	0	1	4	0
Rockweed zone avg.	9	1	1	1	25	1	0	1	3	0
462	2	1	2	3	26	0	10	1	13	0
463	0	0	0	4	35	1	1	0	17	0
464	0	2	5	2	52	3	5	2	16	0
465	0	0	1	1	52	1	4	0	6	0
466	0	0	0	0	30	0	2	0	0	0
Mussel zone avg.	0	1	2	2	39	1	4	1	10	0

Santa Barbara Island, October 14-17, 1997

(Database event #9710)

PURPOSE: To monitor Rocky Intertidal sites at Santa Barbara Island. Shoot vegetation photo points around island.

PERSONNEL: Dan Richards, Marine Biologist, Channel Islands National Park
Derek Lerma, Biological Technician, Channel Islands National Park

PROCEDURE: Arrived on Santa Barbara Island at 1130 on 14 October. The Landing Cove site was worked from 1330-1630, shooting and scoring the photoplots. Photoplot scoring was broken down into more detailed categories to identify the cover in the plots. The categories can be combined into the old categories but this gives us a better breakdown of what some of the miscellaneous organisms are.

On Oct. 15, the Sea Lion Rookery site was worked from 1230-1800 hrs, shooting and scoring photoplots, censusing species in photoplots, and counting motile invertebrates in photoplots. Size frequency measurements of owl limpets were conducted during a 30-minute period. Thirty-minute searches for black abalone and seastars were also conducted, a general species list was made, and the area was documented on video. The morning was spent shooting vegetation photopoints.

Landing Cove was visited again on Oct. 16 to retrieve the temperature logger from under the pier. The unit did not appear to be functioning, so it was brought in. Motile invertebrate counts and a species census was done in each of the photoplots. Seastars were counted in the permanent transect and over the site in a 15-minute search. Three random 50x50 cm quadrat counts were made of purple sea urchins in an upper tidepool. The site was video taped. A general species list was made.

Two SCUBA dives were conducted in the Landing Cove and south on Oct 15 and 16. Seastar and sea urchin condition was noted.

Problems were encountered with the dual strobes and most photoplots were shot with only one strobe. The conditions were bright and photo quality is OK though.

RESULTS: Landing Cove, 14 Oct. 1997, sky clear, Air 25° C, Water 19° C, Wind calm, Surge- light, low tide +0.1 ft @ 1448. 16 Oct. 1997, sky clear, Air 26° C, Water 20° C, Wind calm, Surge moderate, low tide -0.6 ft @ 1620 hrs. No shorebirds were present on the 14th; however, there was a homing pigeon on the intertidal rocks. On the 16th, two wandering tattlers were present in the cove.

Surfgrass, *Phyllospadix torreyi* is slowly taking over in three of the red algal turf plots. Surfgrass now covers 88% of plot 323, up from 81% in 1996. Plot 324 remains diverse with red algae and *Egregia menziesii*. *Pelvetia fastigiata* covered 13-34% of the rockweed plots, no big changes from last year. Barnacle plots ranged from 4-31% barnacles. Plot 316 with only 4% barnacles had 73% cover of a small filamentous red alga.

There are several open patches in the mussel beds including parts of plot 326 and 327. The rocks are mostly bare in the patches except for diatoms. 31% of plot 327 was bare. While only 6% of 326 was bare, 41% was miscellaneous algae, mostly corallines. Presumably, the mussels were torn out by the storm surge generated by Hurricane Nora at the end of September. Some of the planks from the lower landing were damaged then also. No staff was present on the island at the time to witness the size of the waves.

Table 41. Photoplot summary - mean percent cover by zone at Landing Cove.

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals	Phyllospadix
LC	Barnacle	31.2	16.0	0.0	0.0	3.2	48.6	1.0	0.0
LC	Rockweed	12.6	2.0	0.0	21.2	2.6	60.6	1.0	0.0
LC	Mussel	9.6	0.6	0.0	0.0	68.2	18.6	3.0	0.0
LC	Red Algal Turf	0.0	0.0	0.0	0.0	0.0	15.2	0.0	30.8

Only three *Pisaster ochraceus* (2 seaward, 1 landward) were present in the sea star transect. During a 15-minute search covering the entire southern reef, 33 *P. ochraceus* were found. In 1996, there were seven seastars in the transect and 60 on the reef. No

active wasting disease was seen but one star had a recovering wound from a lost arm. One *P. ochraceus* was found on the north section of the site.

We counted *Strongylocentrotus purpuratus* in three random 50 x 50 cm plots in one, of the tidepools on the south side. Counts were 19, 22, and 28 urchins per plot, of those, five urchins were obviously diseased, with sparse short spines and or bald spots.

The sea temperature was 3-4°C warmer than it was in November 1996. There were approximately 30 young sealions present. The only bird present on the 14th was a lost homing pigeon. Two wandering tattlers were observed on the 16th. During our dives we noted that most of the purple sea urchins had short spines and that as many as 10-20% had bald spots or lesions (symptoms of wasting disease). Red sea urchins were also noted with lesions. At least five *Pisaster giganteus* were observed during the dive, only one with disease was noted. A large black sea bass was seen in about 30 feet. Guadalupe cardinalfish, *Apogon guadalupensis*, were found in small caves between 20 and 25 feet depth. At least 15-18 individuals were observed on two different reefs. This may be the first recorded sighting of cardinalfish at Santa Barbara Island.

Sea Lion Rookery, 15 October 1997, sky clear, Air 28°C, Water 20°C, Wind calm, Surge light, tide -0.4 ft @ 1533.

A black turnstone, a pair of black oystercatchers and three western gulls were observed. About 100 California sea lions were present. The temperature on the slope was hot, so most sea lions were in the water. Adult and juvenile opaleye and juvenile zebra perch were observed in good numbers in the tidepools of the reef flat as the tide receded. There are several patches of *Sargassum muticum* on the reef flat.

No abalone were found but six *Pisaster ochraceus* were counted. Few purple sea urchins were present but at least one was observed with bald spots. Several red urchins were present and most appeared to have short spines.

Derek measured 169 owl limpets mostly in the area between plots 348 and 335 during a 30-minute search. Sizes ranged from 19-62 mm.

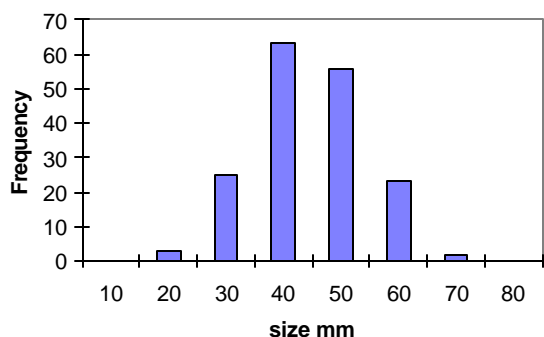


Figure 42. Owl limpet size distribution at Sea Lion Rookery, Santa Barbara Island

Table 42. Owl limpet size distribution at Sea Lion Rookery.

Site	Date	Plot	Mean Size	StDev	Count
SLR	14-Oct-97	timed search	39.95	9.52	172

Most of the upper photoplots were heavily impacted by the sea lions and primarily covered by short *Ulva* sp. The barnacle plots were 23-58% *Ulva* sp. and only 9-30% barnacle. Endocladia zone plots were 3-11% *Endocladia muricata* and 49-73% miscellaneous algae, mostly *Ulva* sp. with *Rhodoglossum affine* making up most of the rest.

Rockweed plots had a variety of algae with *Pelvetia fastigiata* covering 8-33% of the plots. The mussel plots had apparently been impacted by the storm surges and large patches of mussels were torn out of the area of the mussel plots. All plots had some loss. *Mytilus californianus* ranged from 7-59% cover with plot 351 the lowest and 352 the highest. The disturbance exposed all the plot corners normally covered by the layers of mussels. All plots were marked with stainless steel bolts in 1995. At that time plot 352 was positioned on the basis of one corner only. This event exposed the original corners and shows that the new plot is slightly skewed to the offshore side. The new orientation covers about 30% of the old plot. I recommend that the new plot be used from here on as the bolts will be much easier to find and there is little difference in the apparent microtopography of the area. Photos were taken over both plots, but the new plot was scored in the field. The new plot had slightly higher mussel cover.

Table 43. Photoplot summary - mean percent cover by zone at Sea Lion Rookery.

Site	Zone Name	BareRock	Barnacle	Endocladia	RockWeed	Mussels	MiscAlgae	MiscAnimals
SLR	Barnacle	40.8	17.4	1.6	0.0	0.2	38.0	0.2
SLR	Endocladia	23.4	7.0	6.0	0.0	1.4	61.0	1.2
SLR	Rockweed	16.2	1.0	1.6	20.8	8.4	50.8	1.2
SLR	Mussel	1.8	0.0	0.0	0.0	32.4	61.6	4.2

Additional observations: All the vegetation photopoints were found OK and the photos were fine. The descriptions for the points need to be rewritten now that the trails have been realigned. The badlands restoration site looks very good.

American Kestrels, barn owls, and northern harriers were common with at least four of each species present. Also observed; burrowing owl, peregrine falcon, meadowlarks, yellow-rumped warblers, yellow-crowned sparrow, black phoebe, Say's phoebe, mourning dove, rufous-sided towhee, and a Cooper's hawk (?). No visitors came ashore; each day there were several lobster boats, two party-boats, a couple of private sportfishers, one sailboat, and the JUST LOVE. We saw large feeding aggregations of birds off the north and west of the island and occasionally saw large fish rolling at the surface among the birds. Three unidentified whale spouts were seen several miles northwest of the island on the 15th.

Table 44. Motile invertebrate counts in 50 x 50 cm area of photoplots at Sea Lion Rookery, 10/15/97.

zone	Plot #	Tegula funebris	# Littorina spp.	# Acanthin a sp.	# Ocenebra circumtexta	# Nucella emarginata	# Limpets	# Fissurella volcano	# Lottia gigantea	# Lepido-chitona sp.	# Nuttallina sp.	Other species
Barnacle	345	0	87	0	0	0	1	0	0	1	0	0
Barnacle	346	0	189	0	0	0	0	0	0	0	0	0
Barnacle	347	1	168	0	0	0	0	0	1	0	0	0
Barnacle	348	0	31	1	0	0	2	0	0	0	0	0
Barnacle	349	0	267	1	0	0	0	0	0	0	0	0
Mussel	350	0	0	0	0	0	0	5	0	0	0	0
Mussel	351	0	0	0	0	0	0	0	0	0	0	0
Mussel	352	0	0	0	9	0	12	5	5	0	0	7
Mussel	353	0	0	0	7	0	2	5	0	0	0	7
Mussel	354	0	0	0	5	0	2	3	1	0	1	9
Endocladia	335	0	0	0	0	0	14	0	1	0	0	0
Endocladia	336	0	1	0	0	0	7	0	0	0	0	0
Endocladia	337	0	7	0	0	0	114	0	4	0	0	0
Endocladia	338	0	1	0	0	0	1	0	0	0	0	0
Endocladia	339	0	15	0	0	0	6	0	0	0	0	0
Rockweed	330	0	0	1	0	0	20	0	4	0	7	0
Rockweed	331	0	2	0	0	0	26	0	0	0	1	0
Rockweed	332	0	6	1	0	0	33	0	1	0	0	0
Rockweed	333	0	1	0	0	0	38	0	3	0	0	0
Rockweed	334	0	2	0	0	0	26	0	0	0	1	0

Table 45. Motile invertebrate counts in 50 x 50 cm area of photoplots at Landing Cove, 10/16/97.

zone	Plot number	Tegula funebris	# Littorina spp.	# Acanthina sp.	# Ocenebra circumtexta	# Nucella emarginata	# Limpets	# Fissurella volcano	# Lottia gigantea	# Lepidochitona sp.	# Nuttallina sp.	Other species
Barnacle	315	0	255	0	0	0	53	0	0	0	1	0
Barnacle	316	0	12	0	0	0	45	0	0	0	0	0
Barnacle	317	0	9	3	0	0	57	0	0	1	4	0
Barnacle	318	0	5	2	0	0	84	0	3	0	16	0
Barnacle	319	0	21	0	2	0	86	2	1	0	1	0
Mussel	325	0	0	2	5	0	55	1	0	0	1	6
Mussel	326	0	0	3	0	0	12	0	0	0	0	0
Mussel	327	0	0	1	0	0	18	1	0	0	4	0
Mussel	328	0	0	0	2	0	50	3	0	0	3	1
Mussel	329	0	0	0	2	0	83	2	0	0	1	0
Endocladia	320	0	0	0	0	0	0	0	0	0	0	0
Endocladia	321	0	0	0	0	0	0	0	0	0	0	0
Endocladia	322	0	0	0	0	0	0	1	0	0	0	0
Endocladia	323/474	0	0	0	0	0	0	0	0	0	0	0
Endocladia	324	0	0	0	0	0	0	0	0	0	0	1
Rockweed	310	0	0	4	0	0	44	0	0	0	0	0
Rockweed	311	0	0	10	0	0	46	0	0	0	0	0
Rockweed	312	0	0	8	0	0	57	0	0	1	1	2
Rockweed	313	0	0	4	0	0	65	0	0	0	0	0
Rockweed	314	0	0	7	0	0	38	0	0	0	0	0